

Fishery Management Report No. 00-12

Fishery Management Report for Sport Fisheries in the Arctic-Yukon-Kuskokwim Management Area, 1998

by

John Burr

October 2000

Alaska Department of Fish and Game

Division of Sport Fish



Symbols and Abbreviations

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Weights and measures (metric)		General		Mathematics, statistics, fisheries	
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	alternate hypothesis	H _A
deciliter	dL	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
gram	g	and	&	catch per unit effort	CPUE
hectare	ha	at	@	coefficient of variation	CV
kilogram	kg	Compass directions:		common test statistics	F, t, χ^2 , etc.
kilometer	km	east	E	confidence interval	C.I.
liter	L	north	N	correlation coefficient	R (multiple)
meter	m	south	S	correlation coefficient	r (simple)
metric ton	mt	west	W	covariance	cov
milliliter	ml	Copyright	©	degree (angular or temperature)	°
millimeter	mm	Corporate suffixes:		degrees of freedom	df
Weights and measures (English)		Company	Co.	divided by	÷ or / (in equations)
cubic feet per second	ft ³ /s	Corporation	Corp.	equals	=
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	fork length	FL
inch	in	et alii (and other people)	et al.	greater than	>
mile	mi	et cetera (and so forth)	etc.	greater than or equal to	≥
ounce	oz	exempli gratia (for example)	e.g.,	harvest per unit effort	HPUE
pound	lb	id est (that is)	i.e.,	less than	<
quart	qt	latitude or longitude	lat. or long.	less than or equal to	≤
yard	yd	monetary symbols (U.S.)	\$, ¢	logarithm (natural)	ln
Spell out acre and ton.		months (tables and figures): first three letters	Jan., ..., Dec	logarithm (base 10)	log
Time and temperature		number (before a number)	# (e.g., #10)	logarithm (specify base)	log ₂ , etc.
day	d	pounds (after a number)	# (e.g., 10#)	mideye-to-fork	MEF
degrees Celsius	°C	registered trademark	®	minute (angular)	'
degrees Fahrenheit	°F	trademark	™	multiplied by	x
hour (spell out for 24-hour clock)	h	United States (adjective)	U.S.	not significant	NS
minute	min	United States of America (noun)	USA	null hypothesis	H ₀
second	s	U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	percent	%
Spell out year, month, and week.				probability	P
Physics and chemistry				probability of a type I error (rejection of the null hypothesis when true)	α
all atomic symbols				probability of a type II error (acceptance of the null hypothesis when false)	β
alternating current	AC			second (angular)	"
ampere	A			standard deviation	SD
calorie	cal			standard error	SE
direct current	DC			standard length	SL
hertz	Hz			total length	TL
horsepower	hp			variance	Var
hydrogen ion activity	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

FISHERY MANAGEMENT REPORT NO. 99-12

**FISHERY MANAGEMENT REPORT FOR SPORT FISHERIES
IN THE ARCTIC-YUKON-KUSKOKWIM MANAGEMENT AREA, 1998**

by
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October 2000

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PREFACE

The goals of the Sport Fish Division of the Alaska Department of Fish and Game are to conserve wild stocks of sport fish, to provide a diversity of recreational fishing opportunities, and to optimize social and economic benefits from recreational fisheries. In order to implement those goals the Division has in place a fisheries management process.

This report provides information for the Arctic Yukon Kuskokwim Management Area (AYKMA) and is one in a series of reports annually updating fisheries management information about important sport fisheries within Region III. The report is written to make that information available to the State Board of Fisheries, Fish and Game Advisory Committees, the general public, and other interested parties. It presents fisheries assessment information and the management strategies that are developed from that information. In addition, the report includes a description of the fisheries regulatory process, the geographic, administrative, and regulatory boundaries, funding sources, and other information concerning Sport Fish Division management programs within the Management Area.

An annual regional Area Review is conducted in mid-winter during which the current status of important area fisheries are considered and research needs are identified. Fisheries stock assessment research projects are developed, scheduled, and implemented to meet information needs identified by fisheries managers. Projects are planned within a formal Operational Planning process. Biological information gathered during the course of these research projects is combined with effort information and input from user groups and is used to assess the need for and develop fisheries management plans, and propose regulatory strategies.

Sport Fish Division management and research activities are primarily funded by a combination of State of Alaska Fish and Game (F&G) and Federal Aid in Fisheries Restoration (D-J) monies. The F&G funds are from the sale of fishing licenses. The D-J (Dingle-Johnson, named after the congressmen who wrote the act) funds are from a Federal tax on fishing tackle and equipment. D-J funds are provided to the states at a match of up to three-to-one with the F&G funds. There is also an amendment to the D-J Act (W-B, for Wallop-Breaux) that provides money to states for boating access projects at the same three-to-one match with F&G funds. Funding Source for W-B money is a tax on boat gas and equipment. Other, peripheral funding sources can include contracts with various government agencies and the private sector.

This report provides fisheries information for 1998 with preliminary information from the 1999 season. Following the introduction, which includes an overview of the Region, this report is organized into three major sections. **Section I** provides an overview of the Arctic-Yukon-Kuskokwim (AYK) Management Area. Included is a description of the Management Area and subareas, Board of Fish activities, and management information and activities within the area. **Section II** provides effort and harvest results for the Management Area and subareas. **Section III** provides more detailed summaries of major fisheries and activities occurring during the reporting period. Included in these summaries are a fishery description; a description of recent performance of the fishery; a description of recent Board of Fishery actions related to the fishery; a discussion of social or biological issues that may be associated with each fishery; and a description of ongoing research and management activities related to each fishery.

INTRODUCTION

REGION III DESCRIPTION

The Alaska Board of Fisheries (BOF) divides the state into ten regulatory areas for the purpose of organizing the sport fishing regulatory system by drainage and fishery. These areas (different from Regional Management Areas) are described in Title 5 of the Alaska Administrative Code (5 AAC). Sport Fish Division of the Alaska Department of Fish and Game (ADF&G) divides the state into three administrative regions with boundaries roughly corresponding to groups of the BOF regulatory areas (Figure 1). Region I is Southeast Alaska. Region II covers portions of Southcentral Alaska, Kodiak, Southwestern Alaska, and the Aleutian Islands. Region III includes two and most of a third of the BOF fishery regulatory areas. They are the Upper Copper and Upper Susitna regulatory area, most of the Arctic-Yukon-Kuskokwim regulatory area, and the Tanana River Drainage. A portion of the Arctic-Yukon-Kuskokwim regulatory area is excluded from Region III and included in Region II; this is the lower Kuskokwim drainage from the Aniak River downstream and Kuskokwim Bay.

Region III is the largest region, encompassing the majority of the landmass of the state of Alaska (Figure 1). The region contains over 1,251,300 km² (485,000 mi²) of land, some of the state's largest river systems (the Yukon, portions of the Kuskokwim, the Colville, Noatak, and upper Copper River and upper Susitna River drainages), thousands of lakes, and thousands of miles of coastline and streams. Regional coastline boundaries extend from Sheldon Point in the southwest, around all of western, northwestern and northern Alaska to the Canadian border on the Arctic Ocean. Region III as a whole is very sparsely populated, with the most densely populated center located in the Tanana River valley. Fairbanks (population about 31,000) is the largest community.

For administrative purposes Sport Fish Division has divided Region III into five fisheries management areas (Figure 1). They are:

- (1) The Northwestern Management Area (Norton Sound, Seward Peninsula and Kotzebue Sound drainages).
- (2) The AYK Management Area (the North Slope Drainages, the Yukon River Drainage except the Tanana River Drainage, and the Kuskokwim River Drainage upstream from the Aniak River).
- (3) The Upper Copper/Upper Susitna Management Area (the Copper River Drainage and the Susitna River Drainage above the Oshetna River).
- (4) The Upper Tanana River Management Area (The Tanana River Drainage upstream from Banner Creek and the Little Delta River).
- (5) The Lower Tanana River Management Area (The Tanana River Drainage downstream from Banner Creek and the Little Delta River).

Area offices for the five areas are located in Nome/Fairbanks, Fairbanks, Glennallen, Delta Junction, and Fairbanks, respectively.

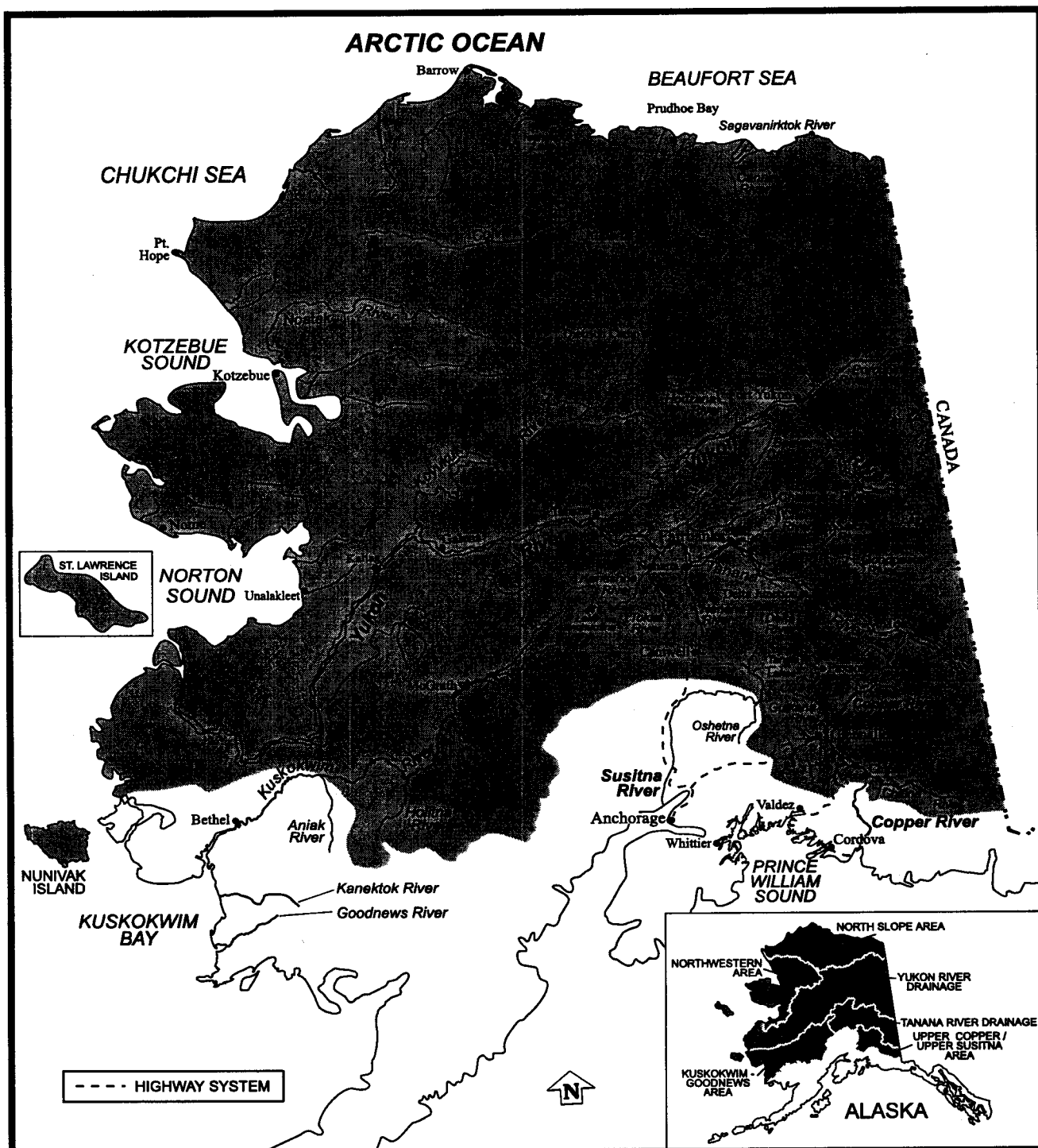


Figure 1.-Map of Region III including management areas.

THE ALASKA BOARD OF FISHERIES

The Alaska Board of Fisheries (BOF) is the seven-member board that sets fishery regulations and harvest levels, allocates fishery resources, and approves or mandates fishery conservation plans for the State of Alaska. Board members are appointed by the Governor and must be confirmed by the legislature. Board members are appointed for three years.

Statewide fisheries issues may be considered at any BOF meeting. Under the current operating schedule, the BOF considers fishery issues for regulatory areas or groups of regulatory areas on a 3-year cycle. The BOF meetings are usually in the wintertime, between early October and late March. Regulation proposals and management plans are received for evaluation by the BOF from ADF&G and the public (any Alaskan can submit a proposal to the BOF), and during its deliberations the BOF receives input and testimony through oral and written reports from staff of the Alaska Department of Fish and Game, members of the general public, representatives of local fish and game Advisory Committees, and special interest groups such as fishermen's associations and clubs.

ADVISORY COMMITTEES

Local Fish and Game Advisory committees have been established throughout the state to assist the Boards of Fish and Game in assessing fisheries and wildlife issues and proposed regulation changes. Advisory committee members are individuals from the local public who are nominated and voted on by all present during an advisory committee meeting. Most active committees in urban areas meet in the fall and winter on a monthly basis; rural committees have generally only one fall and one spring meeting due to funding constraints. Advisory meetings allow opportunity for direct public interaction with Department staff who answer questions and provide clarification concerning proposed regulatory changes. The Boards Support Section within the Division of Administration provides administrative and logistical support for the BOF and Fish and Game Advisory Committees. During 1998, the Department had direct support responsibilities for 56 Advisory committees in the state.

ADF&G EMERGENCY ORDER AUTHORITY

ADF&G has emergency order (E.O.) authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. Emergency orders are implemented to deal with conservation issues that arise that are not adequately controlled by existing regulations. In that scenario, they deal with the situation until it is resolved or the BOF can formally take up the issue. Emergency Orders are also the mechanism by which "in-season" management of fisheries is accomplished. In-season management is usually in accordance with a fisheries management plan approved by the BOF.

REGION III SPORT FISH DIVISION RESEARCH AND MANAGEMENT STAFFING

The Region III Sport Fish Division staff biologists are organized into a research group and a management group. The management group consists of a management supervisor, an area management biologist for each of the five management areas, one or more assistant area management biologists, and two stocked waters biologists. The area

biologists evaluate fisheries and propose and implement management strategies through plans and regulations in order to meet Divisional goals. A critical part of these positions is interaction with the BOF, Advisory Committees, and the general public. The stocked waters biologists plan and implement the Regional stocking program for recreational fisheries. The research group consists of a research supervisor, research biologists, and various field assistants. The research biologists plan and implement fisheries research projects in order to provide information needed by the management biologists to meet Divisional goals.

THE STATEWIDE HARVEST SURVEY

Recreational angling effort, catch, and harvest of important sport fish species in Alaska has been estimated and reported annually since 1977 (Mills 1979-1994, Howe et al. 1995-1999). The Statewide Harvest Survey (SWHS), a questionnaire mailed out to a random selection of sport fish license purchasers, is the instrument that provides the data analyzed to make these estimates. Estimates for a particular year usually become available in August and September of the following year. Effort, catch, and harvest are estimated on a site-specific basis, but estimates of effort directed toward a single species and the resulting species-specific catch-per-unit-effort (CPUE) information can seldom be derived from the report. Utility of the estimates is strongly dependant on the number of responses for a site (Mills and Howe, 1992). Estimates based on 12 or less responses are useful only to document that fishing occurred. Twelve to 29 responses produce estimates useful for indicating relative order of magnitude and for assessing long-term trends, and estimates based on 30 or more responses are generally useful.

SECTION I: MANAGEMENT AREA OVERVIEW

ARCTIC, YUKON, AND KUSKOKWIM AREA DESCRIPTION

The Arctic Yukon Kuskokwim Management Area (AYKMA) consists of approximately 562,000 km² (37% of the entire land area of Alaska) of extremely varied topography, climate, and zoogeography. The management area includes the North Slope of the Brooks Range and Arctic coastal plain, the entire Yukon drainage, and the Kuskokwim drainage upstream of the Aniak River. Included within AYKMA are three of the state's largest river systems (Yukon, Kuskokwim, and Colville), thousands of lakes, and thousands of miles of streams. The area coastline boundary extends from Kuskokwim Bay to Norton Sound (Yukon Kuskokwim Delta) and from Cape Lisburne on the west around northwestern and northern Alaska to the Canadian border on the Arctic Ocean. The area as a whole is sparsely populated. Small communities are scattered along the major river systems of Interior Alaska. On Alaska's north slope, virtually all communities are located along the coast. The communities are invariably located near water, because of the importance of fish and or marine mammals as a food source to native people historically and today.

Access to most of the area is limited to water or air travel. The major river systems provide transportation corridors during winter as well as during open water months. Ground transportation to the north slope is limited to the Dalton Highway (Haul Road) constructed to provide ground transportation to the rich Prudhoe Bay area oil fields. Road access to the Yukon River is provided by the Dalton Highway, by the Steese

Highway at Circle and by the Taylor Highway at Eagle. With the exception of the Dalton Highway, these gravel roads are not maintained during winter. There is no road access to the Kuskokwim River drainage.

Land ownership and jurisdictions fragment this huge area into a complex mosaic. The federal government is the major land manager through its jurisdiction over lands in two National Parks and Preserves (Yukon – Charlie and Gates of the Arctic), seven National Wildlife Refuges (Arctic, Yukon Flats, Kanuti, Koyukuk, Nowitna, Innoko and Yukon Delta), the White Mountains National Recreation Area, the Steese National Conservation Area, the National Petroleum Reserve-Alaska (NPRA) and numerous Wild and/or Scenic Rivers, as well as other classifications of federal lands. Lands held by the State of Alaska, native corporations, and other private landowners comprise the remaining landmass. Arvey et al. (1995) provides a detailed description of the geology and geography for each of the subareas within the AYK Management Area.

For purposes of reporting and organizing statistics in the Sport Fish Statewide Harvest Survey (SWHS), the AYK Management Area is subdivided into three subareas; Yukon (Y), Kuskokwim (V), and Arctic (Z) (Figure 1).

Yukon River Subarea

The Yukon is the largest river in Alaska and its drainage constitutes the fifth largest in North America. The Yukon subarea (statewide harvest Area Y; Figure 2) includes drainages of the Yukon River from the south slope of the Brooks Range to the Bering Sea, from Naskonat Peninsula north to Pastol Bay; and, from the Canadian border west to the Bering Sea. This subarea does not include any portion of the Tanana or Kuskokwim rivers watersheds. Prior to 1990 the Lower Yukon and Kuskokwim rivers were combined into a single subarea for Sport Fish Division reporting purposes. Separate harvest reporting for the two river drainages has been performed since 1990.

Kuskokwim River Subarea

The Kuskokwim River subarea (a portion of Statewide harvest area V, Figure 3) includes the Kuskokwim River watershed up stream of the Aniak River. The Sport Fish Division assigns management responsibility for the Aniak River and the remainder of the Kuskokwim River and Kuskokwim Bay to its Southcentral Region, headquartered in Anchorage. Responsibility for these areas is assigned to Sport Fisheries staff stationed in Dillingham. Most of the sport fishing effort, catch and harvest that is reported by the SWHS for the Kuskokwim Area (Area V –Kuskokwim River and Kuskokwim Bay) comes from waters tributary to Kuskokwim bay or tributaries downstream of and including the Aniak River system.

North Slope Brooks Range Subarea

The North Slope of the Brooks Range subarea (statewide harvest Area Z; Figure 4) includes all waters north of the Brooks Range flowing into the Beaufort and Chukchi Seas from Point Hope on the west to the Canadian border on the east including adjacent saltwater areas. Total landmass within this subarea is approximately 209,800 km².

FISHERY RESOURCES

Virtually all freshwater and migratory fish species sought by anglers in Alaska are available in the AYKMA. All populations are wild; there is presently no enhancement of

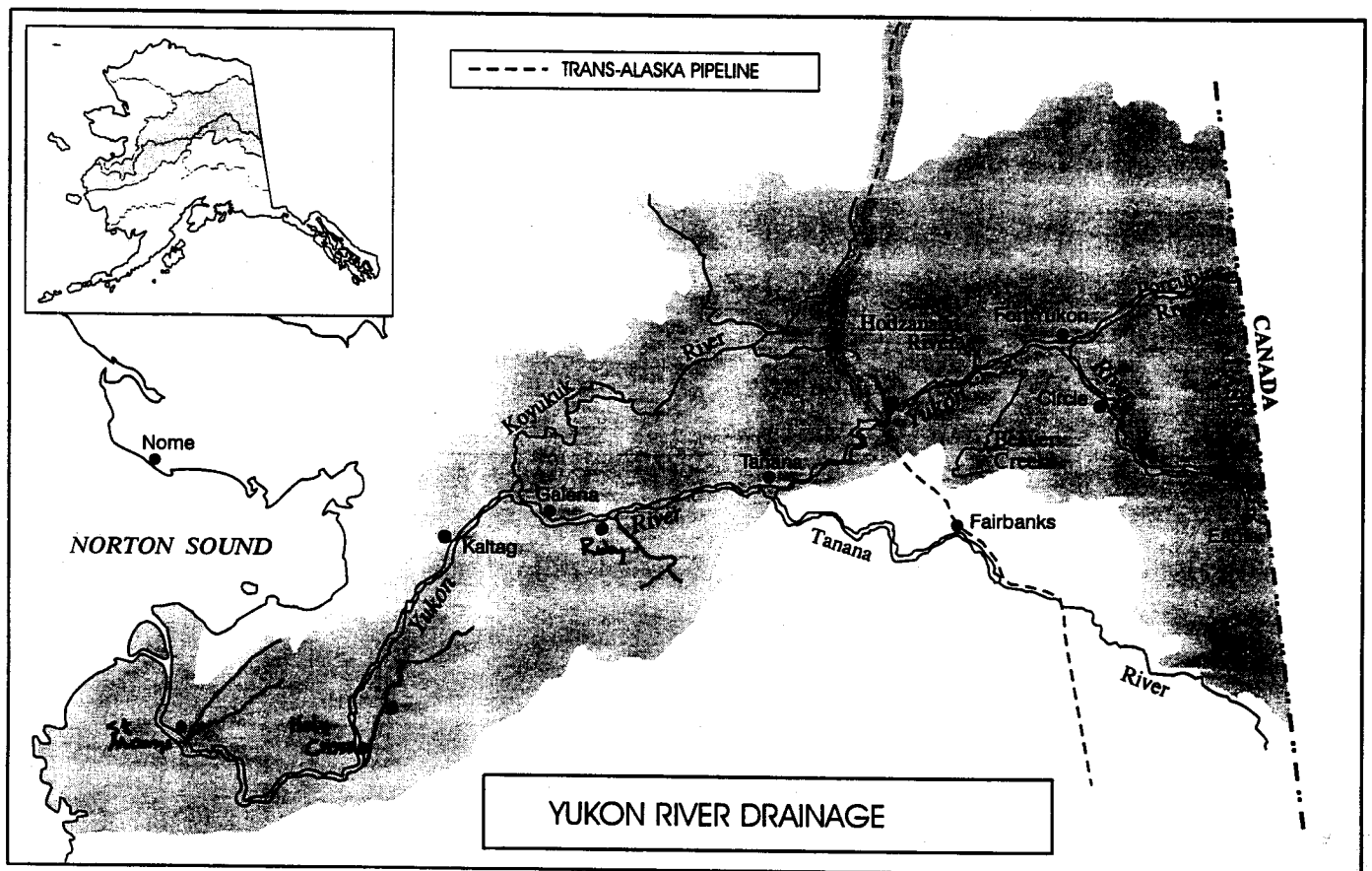


Figure 2.-Yukon subarea, Tanana River drainage is excluded from the AYKMA.

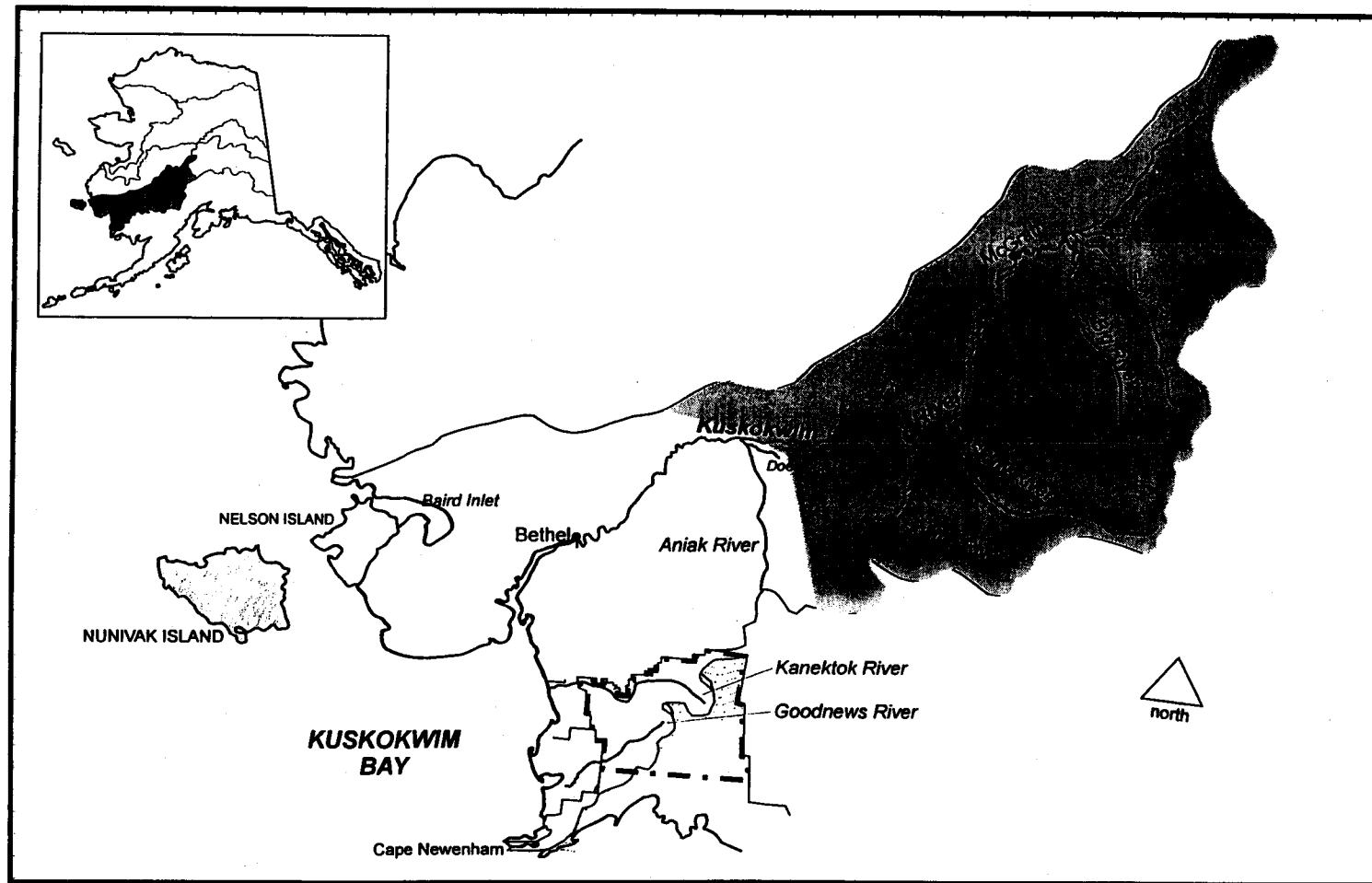


Figure 3.-Kuskokwim subarea of AYKMA.

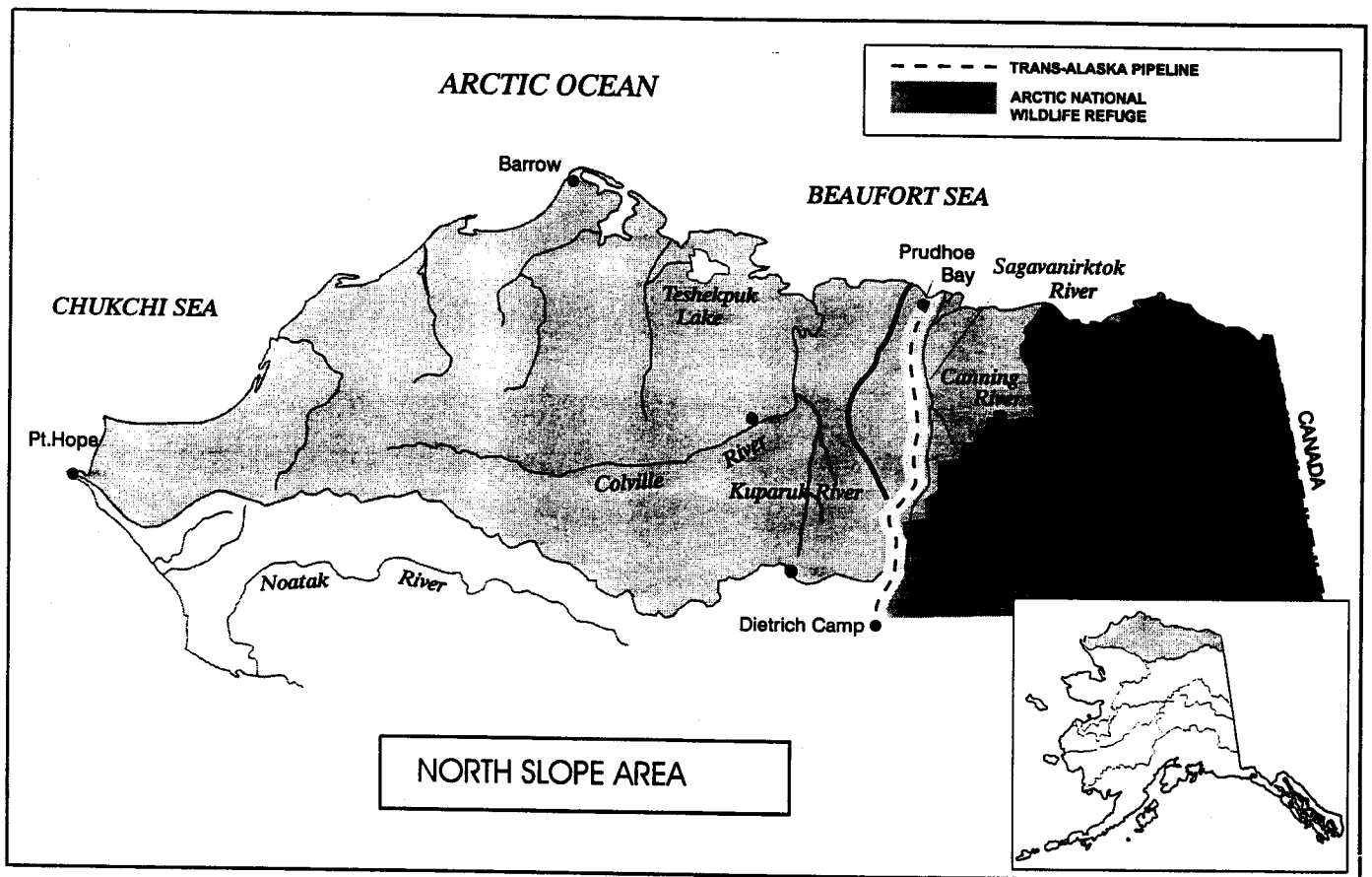


Figure 4.-Map of the North Slope sub-area.

fish populations in the management area. Five species of Pacific salmon, chinook salmon *Oncorhynchus tshawytscha*, coho salmon *Oncorhynchus kisutch*, chum salmon *Oncorhynchus keta*, sockeye salmon *Oncorhynchus nerka*, and pink salmon are available in tributaries of the Yukon and Kuskokwim subareas. Chum and pink salmon and occasionally chinook salmon are present on the North Slope in the Colville River drainage and in coastal streams, but in numbers generally too small to attract or support significant sport fisheries.

Popular fisheries for resident species Arctic grayling *Thymallus arcticus*, Dolly Varden *Salvelinus malma*, northern pike *Esox lucius*, and lake trout *Salvelinus namaycush* are supported by lakes and streams adjacent to the Dalton Highway. Unique opportunities to fish for these species as well as inconnu (sheefish) *Stenodus leucichthys*, burbot *Lota lota* and Arctic char *Salvelinus alpinus* in remote wilderness settings exist through out this management area. Wild stocks of rainbow trout *Oncorhynchus mykiss* are found in small numbers in the Kuskokwim River drainage upstream of the Aniak River. Rainbow trout do not occur naturally in drainages north of the Kuskokwim River. Additional species of whitefish that are of importance to fisheries in the AYK Area include the broad whitefish, *Coregonus nasus*, Arctic cisco, *Coregonus autumnalis*, and Bering cisco, *Coregonus laurettae*. Marine species such as Pacific halibut *Hippoglossus stenolepis*, Pacific cod *Gadus macrocephalus*, saffron cod *Eleginus gracilis*, rainbow smelt *Osmerus mordax*, Dungeness crab *Cancer magister*, Tanner crab *Chionoecetes bairdi*, King crab *Paralithodes camtschaticus*, and others occur in coastal waters from Bristol Bay northwards, and are occasionally harvested by sport anglers.

ALASKA BOARD OF FISHERIES ACTIVITIES

Appropriate fishing regulations are developed through a process that the state of Alaska has established by which the Alaska Board of Fisheries (BOF) adopts regulations based on input from all concerned members of the public and the Alaska Department of Fish and Game (ADF&G).

Alaska Board of Fisheries

Under the current operating schedule, the BOF meets on a three-year cycle. The Alaska BOF met in Fairbanks from December 2 - 9, 1997 and considered seven regulatory proposals from the public that would have affected sport fishing in the AYKMA (Burr et al. 1999). Oral and written reports by staff of the ADF&G and written and oral testimony by members of the public and by representatives of several Advisory Committees were provided during this meeting. The BOF amended and adopted one of the proposals, substituted a Board Proposal for three proposals and failed to adopt three proposals. The Board of Fisheries is next scheduled to review regulation proposals for the AYKMA in the winter of 2000-2001.

Advisory Committees

Public input concerning regulation changes is provided by several means, including direct testimony to the BOF, and by participation in local fish and game advisory committees. Local advisory committees have been established throughout the state to assist the Boards of Fish and Game in assessing fisheries and wildlife issues and proposed regulation changes in the affected areas. Most active committees meet at least once a year, usually in the fall prior to Board meetings. Staff from the Division of Sport Fish and other divisions often attend the committee meetings. In this way, the public are afforded the opportunity for direct public interaction with department staff involved with resource issues of local concern.

During the reporting period, there were at least 15 active Fish and Game advisory committees in the AYKMA. In the Yukon subarea, active committees included: Eagle, Upper Tanana /Forty Mile, Yukon Flats, Tanana /Rampart /Manley, Ruby, Koyukuk, Grayling /Anvik /Shageluk /Holy Cross, Middle Yukon, and Lower Yukon. An additional committee was activated in the Yukon subarea during 1998, the Central Advisory Committee. This committee branched off from the Yukon Flats Advisory Committee following a long struggle by Central AK residents to find representation on the Yukon Flats committee. In the upper Kuskokwim subarea, active committees included: McGrath, and Central Kuskokwim. In the North Slope subarea, two advisory committees are listed. However struggles with inadequate funding and with very low attendance by members from distant sites in this large area resulted in poor representation by local residents. The North Slope Borough (NSB) formed a North Slope Borough Fish and Game Advisory Committee approximately six years ago, which has filled the void created by the inactive "official" advisory committees. The NSB continues to support this advisory effort and appears to provide the needed function.

During 1998-99 Sport Fisheries Division staff participated in meetings of Upper Tanana /Forty Mile, Yukon Flats, Tanana /Rampart /Manley, Koyukuk, Middle Yukon, McGrath, and Central Kuskokwim committees. Division of Commercial Fisheries staff handled most fisheries issues in other Yukon River areas. Staffs representing Subsistence Division and Division of Wildlife Conservation have been active participants in meetings of the NSB advisory committee.

ESTABLISHED MANAGEMENT PLANS AND POLICIES

Specific management objectives for the management area have been identified only in the management plans developed to date. In addition, a series of general divisional criteria have been prepared to guide in the establishment of fishery objectives, and include:

1. **Management and protection of existing fish resources.** Divisional activities should strive to manage and protect Alaska's wild fish stock resources for future generations.
2. **Public use and benefits of existing fish resources.** Alaska's fishery resources should be made available for public use and benefit on a sustained yield basis.
3. **Rehabilitation of depressed stocks and damaged habitat.** Division activities should strive to restore and maintain fish stocks and habitat damaged by man's activities.
4. **Enhancement of natural production or creation of new opportunities.** The Division should pursue creation of new sport fishing opportunities through rehabilitation of natural stocks or creation of new fisheries where these opportunities do not negatively impact other fisheries.

Management plans prepared for specific regional fisheries also identify a series of fishery objectives. While in many cases the objectives are different, some recur frequently in the plans and include:

1. management of sport fisheries so that harvests do not jeopardize sustained yield of the harvested stocks;
2. maintenance, and/or improvement of public access to fishing opportunities;
3. promote awareness of sport fishing opportunities that exist; and,

4. ensure that management costs do not outweigh the public benefits that may be achieved in the fishery.

To date, management plans have been written for the following fisheries.

- North Slope Sport Fishery Management Plan
- Sport Fishery Management for Salmon in the Yukon Drainage
- Sport Fishery Management for Northern Pike in the Yukon Drainage
- Sport Fishery Management for Arctic Grayling in the Yukon Drainage

MAJOR BIOLOGICAL AND SOCIAL ISSUES

1. Dalton Highway/ Prudhoe Bay recreational fisheries. The opening of the entire length of the Dalton Highway (North Slope Haul Road) to public travel in 1994 provided new access to lakes and streams along the route. Increases in recreational fishing effort and harvest have resulted in reductions in bag limits for northern pike and Arctic grayling and in a no-harvest regulation for lake trout within the highway corridor. Due to the unproductive fisheries habitat in the region, chances for overexploitation of these stocks is considered high.
2. North Slope resource development. Development of extensive oil and gas deposits in and around Prudhoe Bay at the mouth of the Sagavanirktok River and west to the Colville River Delta carries the risk of petroleum contamination of the most important streams on Alaska's North Slope for anadromous Dolly Varden. Resident freshwater fish are also at risk because of limited overwintering habitat that is located in river delta areas where most development currently exists. In addition, new petroleum developments that are under consideration would extend exploration into the upstream, foothill areas. Critical over-wintering habitat for entire stocks of Dolly Varden are found in isolated sites within these upstream areas.
3. Development of New Sport Fisheries in Rural Alaska. Relatively rapid development of sport fisheries in remote areas has resulted in friction between local residents and the non-local anglers. In many instances, local people have historically enjoyed nearly exclusive use of fishery resources. Sport Fishing guides and other anglers seeking less crowded fishing opportunities in wilderness settings continue to "discover" less well known but potentially high quality fisheries. As currently popular fishing destinations in Bristol Bay and South Central Alaska become increasingly crowded, anglers and guides are likely to continue to be willing to travel farther to participate in Alaska's fisheries. In addition to the social friction caused by this change in use patterns of remote areas and to some extent because of this friction, the Department will increasingly be expected to provide information on the status of stocks for which there is currently only the most rudimentary information. This is likely to be the biggest challenge in the management of sport fisheries in the AYK Management Area. Recent experiences at the Dall and Holitna rivers are examples of the type of challenges that we should anticipate.
4. Rod and Reel Subsistence. An agenda change request was submitted to the Alaska Board of Fisheries prior to the 1997-1998 AYK meeting which sought to include rod and reel fishing as a legal method for harvesting fish for subsistence throughout the open water season. Currently rod and reel for subsistence fishing is permitted only through the ice. Harvest of fish with rod and reel during open water periods is regulated by Sport Fishing regulation. The primary concern with this potential change is how to manage for sustainable fish

populations with legalization of rod and reel gear for subsistence fishing. We understand that rural resident use patterns have likely incorporated rod and reel in past subsistence harvests, and legalization of this gear will not greatly affect local use patterns. Our greatest concerns relate to changes in urban resident behavior in regards to license sales, visitation to rural fisheries, and harvests of fish populations.

5. Rural resentment of sport fishing and sport anglers. Rural Alaskans generally have a cultural bias against the concept of "sport fishing" and feel that people do not have the right to "play" with food resources. The bias is particularly strong towards catch-and-release practices. This conflict of values has lead to resentment towards sport anglers who wish to fish on private and public lands within the AYK Region.
6. Federal Fishery Management for Subsistence in Alaska's navigable waters. Without changes in current state subsistence laws, Federal fishery managers will assume responsibility for ensuring a rural subsistence priority on navigable waters adjacent to or within the boundaries of Federal Conservation units. There is widespread concern that one result of this action will be reduced opportunity for Sport Fishing throughout the state. Because of the large amount of Federal Public land within AYKMA and because of the high proportion of subsistence users, this loss of opportunity is of acute concern for sport fishermen in the AYKMA.

ACCESS PROGRAM

The Sport Fish Access Program was initiated nation-wide in 1984 as a result of the Wallop-Breaux Amendment to the Sport Fish Restoration (Dingell-Johnson or D-J) Act. The Sport Fish Access Program is composed of two parts. The first involves capital improvement projects, which are of a durable nature, and involves major construction. Typical projects include construction of boat launches, parking areas, camping areas, handicap-accessible public fishing docks, access roads, improved trails, and the purchase or lease of lands or right-of-ways to ensure public access. The second portion of the program is called the Small Access Site Maintenance Project. This ongoing, annually funded program involves maintaining and upgrading existing angler access sites. Activities include placing and maintaining (replacing vandalized) signs at lake and river angling access sites, constructing and maintaining pedestrian and Off Road Vehicle (ORV) trails to fishing sites, securing permanent right-of-ways on public and private land to ensure continued public access to fishing and boat launching sites. Maintaining access roads to boating or angling sites that might not otherwise be maintained, providing portable toilets, picnic tables, and trash removal at heavily used roadside angling sites. Constructing and maintaining outhouses and tent platforms at remote angling sites and producing and printing publications which inform anglers about fishing and boat launching opportunities.

To date relatively few access projects have been proposed for rural AYKMA. This program provided funding for construction of a concrete boat launch to the Yukon River in cooperation with the City of Galena. A proposal for an additional major project in the AYK management area is currently under consideration. This project would upgrade access and parking at the Yukon River, Dalton Highway bridge boat launch.

Table 2.-Number of fish harvested and total catch by species by recreational anglers within the Arctic Yukon Kuskokwim Management Area, 1977-1997.

Year	All Fish	Pacific Salmon					
	Total	Total	Chinook	Coho	Sockeye	Pink	Chum
Harvest							
1983	27,075	1,953	231	535	41	283	863
1984	18,662	806	117	585	0	78	26
1985	20,215	297	61	124	50	0	62
1986	21,455	867	15	454	98	98	202
1987	21,631	1,336	63	732	147	0	394
1988	18,403	1,293	109	456	127	55	546
1989	21,132	1,624	200	315	0	112	997
1990	12,155	1,014	105	264	12	0	633
1991	22,085	1,802	143	911	180	0	568
1992	15,263	2,126	368	826	107	63	762
1993	12,632	1,428	207	674	112	0	435
1994	12,729	1,640	518	972	43	17	90
1995	10,693	736	206	341	0	0	189
1996	9,753	1,219	314	573	24	99	209
1997	11,728	1,448	230	992	37	22	167
1998	14,831	1,616	464	284	142	127	599
Averages							
1983-97	17,041	1,306	192	584	65	55	410
		7.7% ^a	1.1%	3.4%	0.4%	0.3%	2.4%
1988-97	14,657	1,433	240	632	64	37	460
		9.8%	1.6%	4.3%	0.4%	0.3%	3.1%
1993-97	11,507	1,294	295	710	43	28	218
		11.2%	2.6%	6.2%	0.4%	0.2%	1.9%
Catch							
1990	78,996	3,587	226	740	24	0	2,597
1991	72,934	4,288	316	1,576	281	77	2,038
1992	61,553	6,656	1,530	1,887	296	329	2,614
1993	70,146	5,950	1,365	1,265	989	27	2,304
1994	55,644	3,082	717	1,589	69	99	608
1995	49,588	2,749	578	1,023	0	0	1,148
1996	60,030	3,982	1,065	1,615	337	198	767
1997	71,571	5,306	1,303	3,175	211	33	584
1998	86,045	9,337	1,721	804	1,265	1,183	4,364
Averages							
1990-97	65,058	4,450	888	11,030	3,560	3,497	10,822
		6.8%	1.4%	17.0%	5.5%	5.4%	16.6%
1993-97	61,396	4,214	1,006	14,002	3,840	2,066	12,737
		6.9%	1.6%	22.8%	6.3%	3.4%	20.7%

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Table 2.-Page 2 of 3.

Year	Non-Salmon											
	Total	Lake Trout	Char	Rainbow Trout	Grayling	Whitefish	Sheefish	Northern Pike	Burbot	Smelt	Halibut	Other Fish
Harvest												
1983	25,122	987	4,597	52	14,035	450	815	4,083	93	0	0	10
1984	17,856	624	1,702	78	10,271	195	299	3,129	52	0	0	1,506
1985	19,918	2209	4,270	0	10,065	315	385	2,464	210	0	0	0
1986	20,588	923	1,367	0	10,056	4,251	262	3,489	240	0	0	0
1987	20,295	274	3,956	0	12,399	323	436	2,840	67	0	0	0
1988	17,110	218	1,836	54	8,428	1,010	783	4,763	18	0	0	0
1989	19,508	767	2,261	0	10,210	384	1,027	4,310	515	0	0	34
1990	11,141	424	898	0	6,053	339	376	2,527	524	0	0	0
1991	20,283	653	2,177	15	9,440	422	1,482	5,934	160	0	0	0
1992	13,137	796	1,581	24	5,423	294	726	3,846	447	0	0	0
1993	11,204	216	1,699	0	5,180	173	481	2,547	300	0	19	589
1994	11,089	132	1,260	0	5,673	147	521	2,282	508	0	45	521
1995	9,957	129	1,096	0	4,761	100	665	2,318	285	0	0	603
1996	8,534	43	1,533	12	4,751	0	326	1,792	9	0	0	68
1997	10,280	40	1,224	0	4,460	202	697	3,162	239	0	0	256
1998	13,215	273	1,794	0	7,162	228	688	2,912	158	0	0	0
Averages												
1983-97	15,735	562	2,097	16	8,080	574	619	3,299	244	0	4	239
	72.0%	2.6%	9.6%	0.1%	37.0%	2.6%	2.8%	15.1%	1.1%	0.0%	0.0%	1.1%
1988-97	13,224	342	1,557	11	6,438	307	708	3,348	301	-	6	207
	86.5%	2.2%	10.2%	0.1%	42.1%	2.0%	4.6%	21.9%	2.0%	0.0%	0.0%	1.4%
1993-97	10,213	112	1,362	2	4,965	124	538	2,420	268	-	13	407
	88.8%	1.0%	11.8%	0.0%	43.1%	1.1%	4.7%	21.0%	2.3%	0.0%	0.1%	3.5%

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Table 2.-Page 3 of 3.

Year	Non-Salmon											Other Fish
	Total	Lake	Rainbow		Northern							
		Trout	Char	Trout	Grayling	Whitefish	Sheefish	Pike	Burbot	Smelt	Halibut	
Catch												
1990	75,409	2,695	6,973	0	42,902	1,216	2,444	18,368	526	0	0	285
1991	68,646	1,789	11,357	106	36,740	509	1,893	16,092	160	0	0	0
1992	54,897	1,983	8,241	309	25,683	515	2,077	16,031	58	0	0	0
1993	64,196	471	10,399	347	32,868	494	3,444	15,202	363	0	19	589
1994	52,562	688	5,619	108	27,067	427	1,329	13,625	775	0	45	2,879
1995	46,839	622	5,042	0	18,917	127	1,957	18,908	357	0	0	909
1996	56,048	843	6,691	71	30,045	0	1,669	15,862	36	0	0	831
1997	66,265	144	5,812	17	34,723	456	3,130	21,086	375	0	0	522
1998	76,708	1,449	10,303	17	38,398	768	2,860	22,679	208	0	0	26
Averages												
1990-97	60,608	1,154	7,517	120	31,118	468	2,243	16,897	331	0	8	752
	38.1%	0.7%	4.7%	0.1%	19.5%	0.3%	1.4%	10.6%	0.2%	0.0%	0.0%	0.5%
1993-97	57,182	554	6,713	109	28,724	301	2,306	16,937	381	0	13	1,146
	33.3%	0.3%	3.9%	0.1%	16.7%	0.2%	1.3%	9.9%	0.2%	0.0%	0.0%	0.7%

^a Percent of all AYKMA fish.

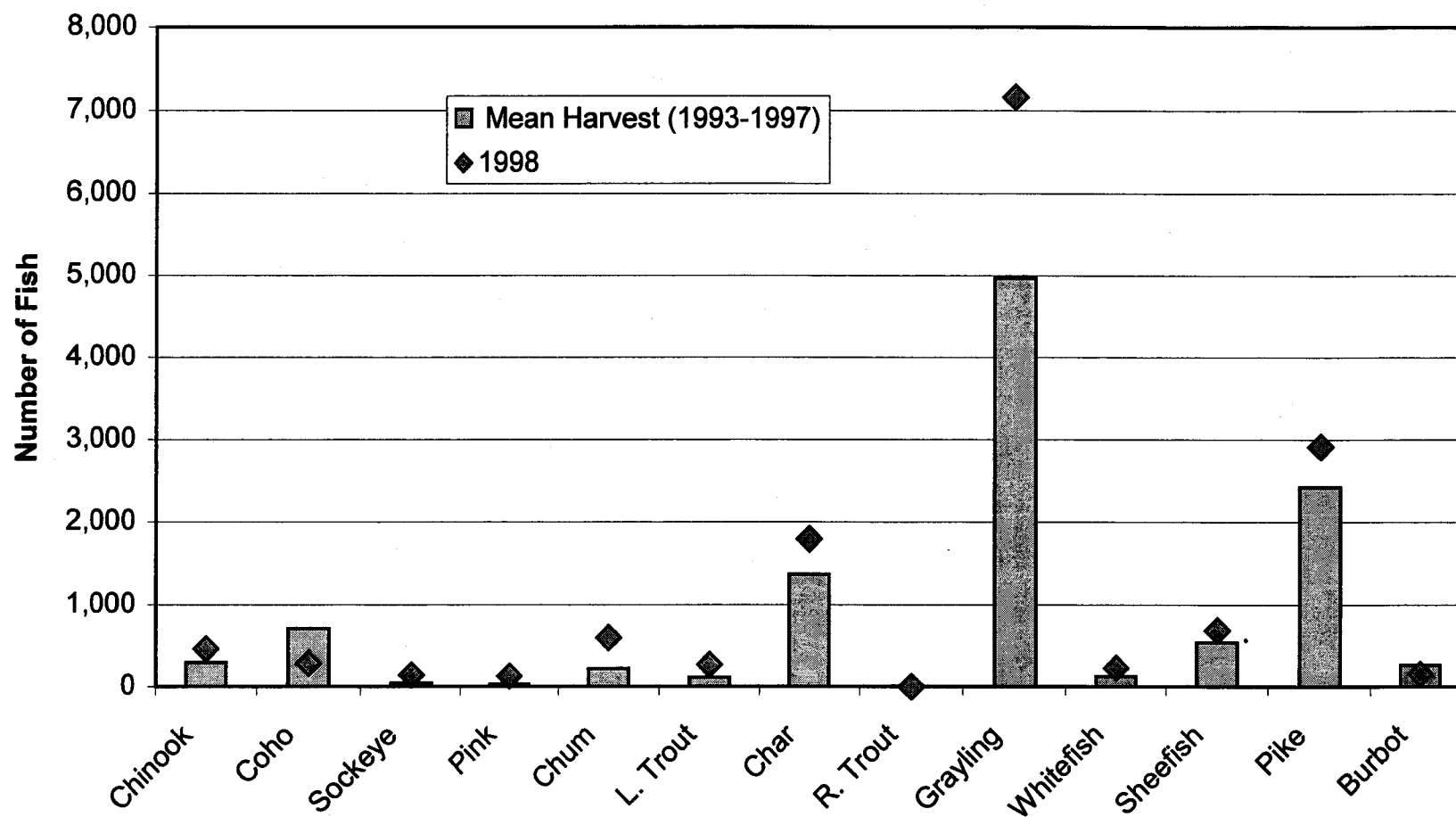


Figure 6.-Sport fishing harvest in the AYKMA.

Table 3.-Commercial and subsistence harvest of salmon in the Yukon and Kuskokwim areas, 1977-1998.

Year	Area					
	Tanana River		Yukon River		Kuskokwim River	
	Commercial	Subsistence	Commercial	Subsistence	Commercial	Subsistence
1977	25,282	52,998	903,199	223,189	639,997	273,748
1978	63,697	48,267	1,386,621	281,828	668,211	175,634
1979	67,300	63,914	1,275,483	406,419	699,201	220,504
1980	61,830	67,025	1,467,065	440,912	1,010,509	278,369
1981	66,743	48,925	1,872,392	398,802	949,974	256,129
1982	39,291	37,884	1,063,534	420,034	1,089,724	302,013
1983	68,596	65,516	1,395,765	441,181	739,832	203,026
1984	85,759	64,551	1,212,685	432,467	1,494,476	220,335
1985	123,709	80,717	1,284,433	462,618	802,191	200,937
1986	56,094	59,219	1,420,000	475,355	1,289,748	247,167
1987	14,398	86,746	742,903	541,538	1,318,438	186,069
1988	80,159	81,820	1,904,591	420,267	2,329,790	306,055
1989	121,254	87,909	1,842,710	382,276	1,505,864	325,363
1990	82,768	69,084	728,671	306,472	1,269,226	314,522
1991	79,186	69,614	1,057,077	278,611	1,310,138	298,517
1992	34,982	55,209	661,771	293,848	1,554,871	246,896
1993	5,150	22,627	229,076	259,556	975,449	240,105
1994	42,861	73,000	342,170	271,049	1,520,377	251,112
1995	121,192	81,410	1,152,465	264,530	1,533,466	236,888
1996	72,053	60,023	845,789	270,048	1,548,722	241,570
1997	28,015	37,681	407,354	251,342	404,847	198,466
1998	1,533	29,765	70,965	192,747	757,912	218,598
Averages						
1977-97	63,825	62,578	1,104,560	358,207	1,174,050	248,735
1988-97	66,762	63,838	917,167	299,800	1,395,275	265,949
1993-97	53,854	54,948	595,371	263,305	1,196,572	233,628

SECTION III: MAJOR FISHERIES OVERVIEW

Waters within the AYK Management Area offer the most remote and diverse opportunities for anglers available in Alaska. Opportunities to harvest within a wilderness setting trophy northern pike, sheefish, Dolly Varden, lake trout, and Arctic grayling are well known. Sport fishing opportunities for salmon are currently not as well known. However, angling for chinook and coho salmon increased during the reporting period in the Kuskokwim and Yukon areas as pressure on other popular sites outside AYKMA continued to increase. Marine sport fisheries are not an important component in the area.

This section provides a summary of sport fisheries that were considered significant in the AYK Management area during 1998-99. The section includes a discussion of the major sport fisheries in the AYKMA by species. Discussion of each fishery will address 1) historical perspective, 2) recent fishery performance (stock status), 3) fishery objectives and management, 4) fishery outlook, 5) recent actions by Alaska Board of Fisheries, 6) current issues and 7) ongoing and recommended management and research activities. Recent fishery performance will focus on data from 1998 and information from the 1999 season. Information regarding the 1999 season will be included as available, but estimates of effort and harvest are not yet available for the 1999 season. Tables summarizing historic sport fish harvests by species and subarea are provided for reference (Table 2, Appendices A1-A4).

YUKON RIVER DRAINAGE SALMON

The chinook, chum, and coho salmon are important subsistence and commercial species in the Yukon River drainage; however, utilization by sport anglers has, to date, been minimal.

Fishery Description and Historical Perspective

Chinook salmon spawn throughout the Yukon River drainage. Chum salmon, including a summer run and a fall run are numerically the most abundant species, and are distributed throughout the drainage. Coho salmon are less abundant and spawn in large numbers in only few identified streams. Pink salmon are locally abundant in some years but are not thought to migrate upstream of the Anvik River. Sockeye salmon occur occasionally, but only a few individuals are taken annually in commercial or subsistence harvests. There may be a small spawning stock of this species in the Innoko River, but the locations of spawning sites have not been identified.

Annual sport harvests of Yukon River drainage salmon have historically been, and continue to be primarily from streams of the Tanana River drainage. Sport fisheries in the Tanana drainage are discussed within the Annual Management Report for the Tanana Management area (Parker and Viavant 2000). Mills 1977-1993 and Howe et al. 1994-1999 report sport harvests from other streams and drainages in the Yukon watershed, primarily from the Andreafsky, Anvik, Porcupine and Koyukuk rivers and their drainages (Tables 3-6). Approximately 12,000 people live along the Yukon River and its tributaries (excluding the Tanana River). Most of these people depend on salmon for either livelihood, subsistence, or both. Sport fishing for salmon is seldom practiced by rural residents compared to the more customary methods such as gill-net and fish wheel, where a larger volume harvest can be taken in the turbid mainstem of Yukon River. Rod and reel fishing for salmon is practiced by some rural residents on occasion and by non-area residents who visit for the purpose of sport fishing. Consequently, the size of reported sport harvest does not reflect the abundance of salmon in the drainage.

Table 4.-Sport harvest of chinook salmon in the Yukon River drainage (1988-1998).

Harvest	Year											Averages	
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-97	1993-97
Yukon R. drainages (Ft. Yukon to Canadian Border)				30	94	-	381	28	-	-		76	82
Fortymile River	-	-	-	-	-	-	-	-	-	-		-	-
Charley River	-	-	-	-	-	-	-	-	-	-		-	-
Yukon R. drainages (Koyukuk R – Ft. Yukon)				10	101	85	-	-	-	-		28	17
Porcupine River	-	-	-	10	39	28	-	-	-	-		20	28
Chandalar River	-	-	-	-	-	-	-	-	-	-		-	-
Beaver & Nome Crks	-	-	-	-	-	-	-	-	-	-		-	-
Dall River	-	-	-	-	-	-	-	-	-	-		-	-
Haul Road Streams	-	-	-	-	-	-	-	-	-	-		-	-
Nowitna River	-	-	-	-	-	-	-	-	-	-		-	-
Melozitna River	-	-	-	-	-	-	-	-	-	-		-	-
Koyukuk River	-	-	-	20	-	-	-	-	-	-		2	-
Yukon R. drainages (downstream from Koyukuk R.)				93	102	19	29	9	20	24	281	42	20
Nulato River	-	-	-	-	-	-	-	-	-	-		-	-
Anvik River	18	30	1	31	94	-	10	-	20	12	45	22	8
Innoko River	-	11	-	-	-	-	-	-	-	-		1	-
Andreafsky River	-	45	-	31	8	19	19	9	-	12	6	14	12
Total	91	100	105	143	313	122	410	37	49	35	281	141	131

- = no data

Table 5.-Sport harvest of coho salmon in the Yukon River drainage (1988-1998).

Harvest	Year											Averages	
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-97	1993-97
Yukon R. drainages (Ft. Yukon to Canadian Border)				-	24	-	-	-	30	21		25	26
Fortymile River	-	-	-	-	-	-	-	-	-	-		-	-
Charley River	-	-	-	-	-	-	-	-	-	-		-	-
Yukon R. drainages (Koyukuk R – Ft. Yukon)				-	130	-	-	-	-	-		-	-
Porcupine River	-	-	-	-	81	-	-	-	-	-		-	-
Chandalar River	-	-	-	-	-	-	-	-	-	-		-	-
Beaver & Nome Crks	-	-	-	-	-	-	-	-	-	-		-	-
Dall River	-	-	-	-	-	-	-	-	-	-		-	-
Haul Road Streams	-	-	-	-	-	-	-	-	-	-		-	-
Nowitna River	-	-	-	-	49	-	-	-	-	-		-	-
Melozitna River	-	-	-	-	-	-	-	-	-	-		-	-
Koyukuk River	-	40	-	89	-	-	-	-	-	-		2	-
Yukon R. drainages (downstream from Koyukuk R.)				341	235	619	728	162	157	12	189	322	336
Nulato River	-	-	-	-	-	-	-	-	-	-		-	-
Anvik River	55	22	22	15	-	36	-	-	-	12	108	16	24
Innoko River	-	-	-	89	-	-	-	-	-	-	81	-	-
Andreafsky River	73	123	206	237	235	583	688	162	157	-	-	246	318
Total	183	215	228	430	551	619	728	162	247	132	189	350	378

- = no data

Table 6.-Sport harvest of chum salmon in the Yukon River drainage (1988-1998).

Harvest	Year											Averages	
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-97	1993-97
Yukon R. drainages (Ft. Yukon to Canadian Border)				-	24	-	-	-	30	21	-	25	26
Fortymile River	-	-	-	-	-	-	-	-	-	-	-	-	-
Charley River	-	-	-	-	-	-	-	-	-	-	-	-	-
Yukon R. drainages (Koyukuk R – Ft. Yukon)				21	168	-	-	-	39	-	-	76	39
Porcupine River	-	-	13	-	8	-	-	-	-	-	-	10	-
Chandalar River	-	-	-	-	-	-	-	-	-	-	-	-	-
Beaver & Nome Crks	-	-	-	-	8	-	-	-	-	-	-	-	-
Dall River	-	-	-	21	-	-	-	-	-	-	-	-	-
Haul Road Streams	-	-	-	-	-	-	-	-	-	-	-	-	-
Nowitna River	-	-	-	-	-	-	-	-	-	-	-	-	-
Melozitna River	-	-	-	-	15	-	-	-	-	-	-	-	-
Koyukuk River	-	10	-	-	23	-	-	90	-	158	-	28	50
Yukon R. drainages (downstream from Koyukuk R.)				423	175	73	90	99	56	9	412	132	65
Nulato River	-	31	25	-	5	-	-	-	-	-	-	6	-
Anvik River	18	226	101	188	137	18	10	-	-	9	263	71	7
Innoko River	-	21	-	-	-	-	-	-	-	-	58	-	-
Andreafsky River	-	112	76	31	-	55	80	99	56	-	15	51	58
Total	546	997	417	449	618	193	90	189	95	167	412	376	147

Recent Fisheries Performance

Summary of 1998 Yukon Salmon Runs

In 1998 the Yukon River experienced disappointing returns of salmon with generally late run timing. The very poor returns had a disastrous impact on the commercial fisheries. All run assessment tools indicated that the 1998 **chinook salmon** return was weak in abundance with timing later than average. Total run abundance was estimated to be about 176,000 fish compared with 363,000 and 341,000 in 1995 and 1997. Age-5 chinook comprised a larger than normal proportion of the run, but this group showed only normal abundance. Given the large return of age-4 chinook in 1997, the abundance of age-5 in 1998 was less than expected. Other age groups, particularly age-6, were well below normal. Commercial fishing was severely restricted in upriver districts. Chinook salmon commercial harvest was 43,618 (59% below recent five-year average; Appendix B1).

The **summer chum** salmon run in 1998 was assessed to be later than average and very weak in abundance. Total run abundance was estimated to be about 979,000 fish compared with 4,090,000 and 1,593,000 in 1995 and 1997. No escapements in monitored tributaries met minimum goals or were considered adequate. No commercial fishing periods directed towards summer chum salmon occurred in 1998 except for a single three-hour test period in District 1. Summer chum salmon commercial harvest (catch incidental to chinook fishery) was 28,611 (93% below recent five-year average; Appendix B2).

The 1998 **fall chum salmon** run was among the latest on record and only about 45% of the preseason projected return of 880,000. In early August 1998 it was estimated that the fall chum salmon return would fall below the 600,000 level. No commercial salmon fishing occurred in fall 1998. On August 15 personal use fisheries were closed and the sport fishery for chum salmon was restricted to catch-and-release throughout the entire Yukon River drainage. Because of these actions, no fall chum salmon were harvested in the commercial, personal use or sport fisheries in 1998. By late August, available information indicated that the fall chum salmon run would fall below 450,000. The Fall Chum Salmon Management Plan (Appendix B4) directs the department to achieve a minimum drainage-wide escapement level of 350,000 fish when overall run size is between 350,00 and 450,000. Annual subsistence harvest generally range between 100,000 and 200,000 fall chum salmon. Implementing subsistence salmon fishing restrictions was necessary. As additional data became available in September it became apparent that additional restrictions in the fall subsistence fishery were needed to achieve the 350,000 escapement goal. Subsistence restrictions were lifted after the majority of fall chum salmon had migrated through traditional fishing areas to upriver spawning grounds. This provided for subsistence fishing opportunities for coho salmon.

Coho salmon escapement assessment is very limited and without information from commercial and personal use harvests only general inferences are possible. The only escapement goal that is presently in place for the Yukon drainage is the Delta Clearwater in the Tanana River drainage. The minimum escapement goal is 9,000 fish based on a boat survey during peak spawning. In 1998 the survey estimated an escapement of 11,100 coho in the survey area.

Summary of 1999 Yukon Salmon Runs

The 1999 Yukon River chinook, summer chum and fall and chum salmon runs continued to exhibit the decline in productivity observed in recent years.

The 1999 **chinook salmon** was better than the disastrous return in 1998 but was assessed below average based on commercial harvests and escapement estimates from selected tributaries. The return was dominated by age-6 fish to a greater extent than normal. However the production from the 1993 parent year appears to have been poor given the good escapements observed that year. Age-5 chinook were much less abundant than expected based on parent year escapement. As a result of lower than average total return and lower than anticipated percentage of age-5 chinook in 1999, the outlook for the 2000 chinook season is for poor return.

Summer chum salmon abundance has been below average to poor since 1997, although parent year escapement were very good from 1994 through 1996. Return of summer chum salmon in 1999 was assessed to be very poor. This year no spawning escapements in monitored tributaries met minimum escapement goals or were considered adequate. Most escapement monitoring projects indicated lower numbers in 1999 than in 1998. No commercial fishery directed at summer chum salmon was possible.

The early component of the **fall chum** salmon run was strong suggesting a good return for 1999. Commercial fishing was permitted during the early stages on the run. However the middle portions of the run were weak. Preliminary results indicate below average return with estimated total run size between 500,000 and 600,000, less than the 675,000 minimum threshold identified to support commercial fishing (Appendix B4). The number of returning age-4 and age-5 fall chum salmon was especially discouraging in light of the very large parent year escapements; fall chum salmon escapements in 1994 and 1995 were among the best on record. In 2000 the primary parent years will be 1995 and 1996; very strong runs with excellent escapements throughout much of the drainage were documented for these years. However, uncertainty about the returns (production) from these parent years based on performance in recent years results in a cautious and not overly optimistic outlook for 2000.

The **coho salmon** return in 1999 was judged to be of average size with late run timing. This run assessment is based on lower river test fishing and on Pilot Station sonar counts. Assessment of coho spawning escapement is very limited. The only escapement goal that is presently in place for the Yukon drainage is the Delta Clearwater in the Tanana River drainage. The minimum escapement goal is 9,000 fish based on a boat survey during peak spawning. In 1999 the survey estimated an escapement of 10,975 coho in the survey area.

Summary of 1998 Sport Fisheries

Estimated sport harvest of **chinook salmon** from the entire Yukon subarea (Tanana River excluded) during 1998 was 281 fish (Table 4). This harvest is greater than the most recent five-year average of 131 chinook salmon but within the range of values reported during the period. Total sport catch (including harvested and released fish) of chinook salmon in the Yukon subarea was estimated to be 554 fish in 1998 (Appendix A1). As in previous years, most of the estimated catch and harvest of chinook salmon is from Yukon drainages downstream from the mouth of the Koyukuk River including the Anvik and Andreafsky rivers (Table 4).

Sport fisheries harvested an estimated 412 **chum salmon** in 1998 (Table 6). Total catch of chum salmon (harvested and released) from the recreational fisheries during this period was estimated at 3,998 fish; the average total sport catch from 1993-1997 was 1,137 chum salmon. In most years, the sport harvest of chum salmon is more widely distributed within the drainage than are harvests of chinook or coho. In 1998 all harvest of chum salmon was from the lower river summer chum salmon run; the fall chum salmon season was restricted to catch-and-release only

by emergency order. The Koyukuk, Anvik and Andreafsky rivers have contributed most of the catch of this species in recent years.

Sport harvest of **coho salmon** during 1998 was estimated to be 189 fish (Table 5). The recent five-year average harvest was 378 coho salmon. Total catch from the sport fishery during the reporting period was estimated to be 465; about 70% the five year average of 660. Like chinook salmon, most of the coho fishery occurs downstream of the Koyukuk River primarily in the Anvik, Innoko and Andreafsky river drainages.

The sport fisheries for these three principal species of salmon have demonstrated only modest change in participation and harvest in recent years. Relative to the size and the productivity of the Yukon system, the estimated sport harvest is extremely light and is unlikely to impact the runs to a measurable degree.

Fishery Objectives and Management

The commercial, subsistence, and personal use fisheries are managed by the Commercial Fisheries Management and Development Division. As with other fish and wildlife populations, subsistence use has been designated as the highest priority among beneficial uses. Management of these fisheries is complex due a wide range of stock specific abundances, overlap of inter and intra-specific run timing, the immense size of Yukon River drainage, allocation between numerous user groups and international management treaties. The Department is unable to manage individual stocks in this mixed stock fishery because of inadequate stock specific information.

Guideline harvest ranges have been established for commercial fisheries targeting chinook, summer chum, and fall chum salmon throughout the Alaskan portion of the Yukon drainage (Appendix B5). The Department attempts to manage the commercial fisheries such that the harvest in each district is proportionally similar to respective guideline harvest ranges.

The current guideline harvest range for commercial harvests of **chinook salmon** is 67,350 to 129,150 and has been in place since 1981. A Yukon River **summer chum salmon** commercial guideline harvest range of 400,000 to 1,200,000 was established by the BOF in 1990. The harvest is to be divided between the districts in proportion to historic levels. In 1994 the BOF adopted the Anvik River Chum Salmon Fishery Management Plan that established a commercial roe fishery for summer chum salmon within the Anvik River. The guideline commercial fishery harvest range for **fall chum salmon** is 72,750 to 320,500 (Appendix B5). In 1994 the *Yukon River Fall Chum Salmon Management Plan* was adopted. The plan has been subject to numerous modifications. The 1998 plan has identified the need for 400,000 fall chum salmon for escapement and approximately 200,000 chum salmon for Alaskan subsistence and Canadian harvests. Under the plan, commercial fishing in all districts is allowed only when projected run size in-season is greater than 675,000 fall chum salmon. When run size is predicted to be between 550,000 and 600,000, personal use and sport fisheries are closed and subsistence fisheries are restricted. In addition, beginning in 1990 the plan includes an effort to rebuild both Canadian and Toklat rivers (Tanana River drainage) fall chum salmon stocks.

Coho salmon returns are of lesser magnitude in the Yukon River than are fall chum salmon and have a slightly later but overlapping run timing. Under the current management strategy coho salmon are taken incidentally to the commercial fishery directed at fall chum salmon. However, in November 1998 the BOF adopted the *Yukon River Coho Salmon Management Plan* (Appendix B6). This plan provides for a directed commercial fishery for coho salmon only

under unique circumstances. It is very unlikely that the conditions outlined in the coho salmon plan would occur in a given year. In most years fall chum salmon will continue to be the primary species of management concern during the fall season with only incidental catches of coho salmon.

Sport fishery management objectives are identified in the *Sport Fishery Management Plan for Salmon in the Yukon Drainage* (ADF&G 1993). These objectives are to: 1) manage sport fisheries for salmon in Yukon River tributaries so that sport harvest do not threaten sustained yield from any stock; 2) increase public awareness of fishing opportunities; 3) improve access to salmon fishing locations; and, 4) achieve benefits to the angling public that out weigh the costs of management and research.

In comparison to commercial, subsistence, and personal use fisheries, sport fisheries for salmon in the Yukon subarea of the AYKMA have very limited impact on stocks of salmon. Hence, there is very little effect that management of the sport fishery can have on the annual status of the various salmon stocks. Therefor the goal of sport fishery management is to maintain a reliable level of opportunity for anglers to participate in the fisheries throughout the season. To this end, emergency actions to restrict harvest and/or in season regulations for the sport fishery are generally not contemplated unless it becomes apparent that the size of the run is so small that restrictions in the subsistence fishery will be necessary. In the case of fall chum salmon management, the BOF has identified the threshold run size at which emergency restrictions in the sport and personal use fisheries will occur.

Fishery Outlook

Poor returns of chum salmon and lower than expected returns of chinook salmon in recent seasons in spite of good to excellent escapement of primary parent years results in a cautious and not overly optimistic outlook for Yukon River salmon runs in 2000. A large degree of uncertainty exists concerning the ocean survival particularly of chum salmon. Continued pressure to restrict or close sport fisheries for salmon as restrictions in commercial fisheries occur can be expected. Once pre-season projections are provided by the Commercial Fisheries Management and Development (CFMD), management of sport fisheries for Yukon salmon may include reduced bag limits to provide a continued level of opportunity for anglers throughout the season.

Recent Board of Fisheries Action and In-season Management

In 1987, bag and possession limits were established throughout the drainage for all salmon species. In 1994, the BOF opened the Ray River and the Yukon River within the Dalton Highway Corridor to chinook salmon fishing (Burr et al. 1998). The *Yukon River Fall Chum Salmon Management Plan* was adopted in 1994 and has been subject to numerous modifications; the most recent in 1998. A *Coho Salmon Management Plan* for the drainage was adopted in November 1998. The plan seeks to provide a new directed commercial fishery on coho stocks in the drainage.

Current Issues

The primary issue that is likely to affect all users (including recreational anglers) of stocks of salmon in the Yukon subarea is the assumption of management of subsistence fisheries by the federal government in October 1999. Recent decisions in federal courts have found that the navigable waters for which the federal government maintains a reserved water right are federal public land. As a result of this determination, the federal land management agencies assert the

right to manage fish and wildlife resources to provide a rural subsistence priority. The state of Alaska also provides for a priority subsistence use of these resources but is unable to discriminate between rural and urban users due to constitutional restraints. There is widespread concern that federal management will result in loss of opportunity for non-subsistence uses of fish resources particularly recreational uses.

The adoption of the Coho Salmon Management Plan (Appendix B6) for the Yukon drainage is of concern because of the potential loss of recreational opportunity. Recreational fisheries for coho salmon generally occur upstream of areas where a commercial fishery is likely to occur. At this time, recreational fisheries in the Yukon drainage are very limited except in waters of the Tanana drainage. It is difficult to predict the potential effects a new commercial fishery directed at coho salmon may have on recreational opportunities. The conditions (biological and market) necessary to trigger directed coho salmon fishery are also difficult to assess due to the shortage of in-season information on coho stocks.

Recommended Research and Management Activities

Currently, there is no active research program concerning the salmon sport fishery in the Yukon River drainage because of the minor nature of the fishery.

In July 1999 a public meeting was arranged with Algaaciq and Yupiit of Andreafsky and Division of Sport Fisheries personnel in St Mary's concerning the growth of the sport fishery in the Andreafsky River. At issue is the recent use of the area by a non-resident sport fishing guide targeting chinook salmon. Local residents are concerned about the escalation of this type of use and reference the growth of the sport fishing industry in middle and lower Kuskokwim tributaries as a potential future for the Andreafsky. This sport fishery is in the very early stages of development and in fact no recreational fishing guiding activities were reported in 1999. Resolutions prepared by local residents were presented during the meeting. The resolutions seek 1) a moratorium on commercial activities (including sport fish guiding) in the Andreafsky River until the impacts on subsistence use of the resources are studied and 2) relocation of the regulatory markers at the mouth of the Andreafsky River to provide greater protection to salmon migrating up the Andreafsky. A regulatory proposal to the BOF seeking to establish the location for these regulatory markers is anticipated.

A reconnaissance of sport fisheries for salmon on the Anvik River is planned for 2000. At least three sport fish guiding businesses are presently using this drainage. Given the rapid growth of sport fisheries for chinook and coho salmon in the Aniak and other lower Kuskokwim River tributaries, a general investigation of the distribution, timing, and a description of the anglers participating in this developing sport fishery is recommended.

UPPER KUSKOKWIM RIVER SALMON

Most of the sport fishing effort, catch and harvest that is reported by the SWHS for the Kuskokwim Area (Area V—Kuskokwim River and Kuskokwim Bay) comes from waters tributary to Kuskokwim bay or tributaries downstream of and including the Aniak River system. Sport fishing for salmon and other species upstream of the Aniak River confluence has historically been very limited.

Fishery Description and Historical Perspective

Six species of salmon occur in the Kuskokwim Area, with chum and coho being the most abundant species. Chinook, sockeye and chum salmon enter streams in late May and early June.

Coho salmon begin entering streams in mid July with entry continuing into September. Pink salmon occur throughout the drainage but subsistence use and commercial markets are limited. In the Kuskokwim River drainage, most salmon fishing is conducted under commercial and subsistence regulations by local residents.

The Chinook salmon fishery was the mainstay of the commercial and subsistence fisheries of the Kuskokwim River until the mid-1980's when escapements dropped below levels believed necessary to sustain recent harvests. Various harvest restrictions on the commercial fishery since 1985, coupled with apparent increases in stock productivity reversed the trends of declining escapement, but the targeted commercial fishery for chinook salmon has been largely eliminated, leaving the subsistence fishery as the largest-volume fishery for the species. Since 1987 the commercial chinook salmon catch has been incidental to the chum salmon fishery, although, substantial numbers of chinook are still harvested in the commercial fishery.

Coho salmon are abundant in the Kuskokwim River drainage and returns of coho salmon to the Kuskokwim River may be the largest to a single river drainage in Alaska. Coho salmon are the most important species in the commercial fishery both in term of harvest numbers and value to fishermen (Burkey et al. 1999). Western Alaska coho salmon are thought to spawn primarily in spring-fed portions of streams. The upper Kuskokwim River and its tributaries that drain the northern slopes of the Alaska Range are extensively underlain with alluvial gravels as a result of outwash from the Alaska Range. The resulting gravel aquifers provide high quality spring water for spawning and rearing of coho salmon in the Kuskokwim drainage.

Sport fishing is conducted by persons visiting the area on guided and personal fishing trips, or in conjunction with hunting activity in the fall. Annual total sport harvests of the four principal species of Pacific salmon from the upper portion of the Kuskokwim drainage have averaged less than 1,000 per year since inception of the Statewide Harvest Survey in 1977 (Mills 1977-1994; Howe et al. 1995-1999). While sport harvests of chinook and coho salmon have increased in recent years in down-river and Kuskokwim Bay areas, growth in the recreational fishery in the upstream area has occurred only very recently (Table 7).

Most of the change observed in the Kuskokwim drainage upstream of the Aniak River has occurred within the Holitna River system. A limited sport fishery for chinook salmon occurs at the George River and other small tributaries in the area. The Salmon River (tributary to the Big River) near Nikolai and McGrath also supports a small sport fishery on a chinook salmon spawning stock by local residents. Except for the Holitna River fishery, estimates of recreational effort or catch are not reported by the SWHS because of the small level of participation in these fisheries.

Recent Fisheries Performance

Summary of 1998 Kuskokwim Salmon Runs

Overall, the 1998 Kuskokwim River salmon runs were among the poorest on record. In the Kuskokwim River, various test and escapement projects indicated low to adequate returns of chinook and sockeye salmon but poor return of chum salmon and below average coho salmon run strength. However, due to unusually high water levels in the Kuskokwim River drainage¹, escapement projects with the exception of Aniak sonar were unable to operate for significant portions of the chinook, sockeye, and chum runs. The weak chum return resulted in a

¹ Water levels were above recent 15-year average for nearly all of July and August; record high water levels were recorded for 26 of 61 days.

conservative number of commercial openings. There were no commercial openings for chum salmon in the middle Kuskokwim due to lack of processor interest.

Total estimated commercial catch for the Kuskokwim area in 1998 was 44,192 chinook (18% below the recent 10-year average); 129,449 sockeye (21% below), 311,910 coho (51% below); 2,720 pink (83% below even yr); and 267,059 chum (49% below, Appendix B1-B3). The below average harvests were due primarily to low catches in the Kuskokwim River; harvests in Kuskokwim bay were generally near average.

An important tool utilized to assess salmon escapement (especially coho) in the Kuskokwim River is the Kogrukluik weir located in the upper Holitna River system which has been operated continuously since 1976. Estimated passage by species in 1998 followed by minimum escapement goals were: 11,869 (10,000) chinook salmon, 36,424 (30,000) chum salmon, 16,769 (no escapement goal, average is 9,500) sockeye salmon and 24,344 (25,000) coho salmon (Appendix C1). Escapement goals for all species in this Holitna River tributary were attained except for coho salmon.

Preliminary Description of the 1999 Kuskokwim Salmon Runs

Returns of salmon to the Kuskokwim River were poor again in 1999. Based on various test-fish and escapement projects, there were low to adequate returns of chinook and sockeye salmon, but very poor returns of chum and coho salmon. As a result of weak runs of chum and coho, very few commercial fishery openings were permitted in the in-river districts (W-1 and W-2). The incidental commercial catch of chinook and sockeye salmon were below average because of reduced fishing time. Total estimated commercial catch for the entire Kuskokwim area in 1999 was 25,019 chinook (51% below the recent 10-year average); 81,185 sockeye (50% below), 32,251 coho (95% below); 2 pink salmon (99% below odd yr); and 72,665 chum (82% below).

The estimated number of salmon passing through the Kogrukluik River weir during 1999 by species was 5,570 chinook salmon (44% below 10,000 goal), 13,820 chum salmon (54% below 30,000 goal), 5,856 sockeye (38 % below average), and 12,609 coho salmon (50% below 25,000 goal, Appendix C1).

Recreational Salmon Fisheries 1998

Sport harvest of all salmon species in the upper Kuskokwim River in 1998 continued to be light, conforming generally to the historic pattern. Estimated total harvest of salmon in the upper portion of the Kuskokwim River in 1998 was 526 fish and is consistent with average harvest of 606 salmon during the recent five-year period (Table 7.) The recreational harvest of coho salmon was lower; 95 coho salmon in 1998 (18% of all salmon) compared with an average of 333 fish (55%, Table 7) in the last five-year period. Information on estimated total catch (fish harvested and fish released) for these fisheries show a similar magnitude and pattern of use (Table 8).

The distribution of the salmon fishery within the upper portion of the Kuskokwim River appears to have been different in 1998 from recent patterns. In 1996 and 1997 nearly 60% of the estimated salmon harvest from the upper Kuskokwim came from the Holitna River (Table 7). In contrast, in 1998 approximately 90% of the estimated harvest came from other locations. Sites that have been identified include George, Tatlawiksuk, Takotna and Salmon rivers.

Estimated levels of effort harvest and catch for the entire Kuskokwim River and Kuskokwim Bay are provided in Appendix A3 to facilitate comparison with commercial and subsistence uses

Table 7.-Sport fishing effort and harvest of principal species in the upper Kuskokwim River drainage (1988-1998).

Harvest	Year											Averages	
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-97	1993-97
All Kuskokwim Drainages upstream from Aniak River													
Fishing Effort (days fished)													
	1,531	2,641	2,275	1,966	1,829	2,650	2,993	2,181	1,864	3,262	3,316	2,319	2,590
Harvests													
Chinook Salmon	18	100	-	-	55	85	108	169	265	195	183	100	164
Chum Salmon	-	-	216	119	129	225	-	-	105	-	187	79	66
Sockeye Salmon	127	-	12	-	49	112	43	-	24	37	61	40	43
Coho Salmon	273	56	36	481	275	55	244	170	336	860	95	279	333
Arctic Grayling	1,330	606	301	569	107	218	284	357	270	250	1,933	429	276
Northern Pike	1,237	794	53	1,480	256	142	314	381	102	239	466	500	236
Sheefish	127	270	53	141	173	45	130	151	-	251	87	134	115
Dolly Varden	200	188	18	245	65	79	156	78	71	232	141	133	123
Holitna River													
Fishing Effort (days fished)													
	346	722	398	1022	480	763	949	640	1045	2063	912	843	1,092
HARVESTS													
Chinook Salmon	18	156	-	-	23	68	40	19	235	173	54	73	107
Chum Salmon	-	-	14	119	91	208	-	-	28	-	-	46	47
Sockeye Salmon	-	-	-	-	-	43	-	-	12	25	-	8	16
Coho Salmon	91	-	12	205	130	-	-	170	159	423	-	119	150
Arctic Grayling	73	128	18	312	23	-	-	184	121	143	127	100	90
Northern Pike	528	82	53	504	145	9	155	166	79	214	118	194	125
Sheefish	36	90	53	128	173	45	130	113	-	183	67	95	94
Dolly Varden	36	50	18	216	-	79	-	52	51	72	25	57	51
Holitna Total Harvest	782	506	168	1484	585	452	325	704	685	1233	391	692	680
Total Harvest	4,549	2,420	1,203	3,623	1,536	1,095	1,655	1,271	1,309	2,086	3,260	2,075	1,483

Table 8.-Sport catch of principal species in the upper Kuskokwim River drainage (1990-1998).

	Year									Averages	
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1990-97	1993-97
All Kuskokwim Drainages upstream from Aniak River											
CATCH											
Chinook Salmon	27	-	288	725	207	401	883	1,145	1,167	460	672
Chum Salmon	448	199	578	1,063	247	414	343	103	366	424	434
Sockeye Salmon	24	76	189	980	60	-	337	211	224	235	318
Coho Salmon	207	717	558	242	453	472	1,318	2,848	334	852	1,067
Arctic Grayling	2,761	4,082	1,775	2,103	2,556	2,036	3,868	5,159	11,912	3,043	3,144
Northern Pike	634	2,197	1,230	1,565	1,877	3,080	1,473	2,266	2,816	1,790	2,052
Sheefish	193	398	508	1,317	208	575	206	2,113	1,500	690	884
Arctic Char	387	3,427	622	2,204	528	1,062	535	2,173	648	1,367	1,300
Holitna River											
Catch											
Chinook Salmon	27	-	109	375	110	91	804	814	335	291	439
Chum Salmon	101	159	471	881	38	327	193	103	25	284	308
Sockeye Salmon	-	76	-	902	-	-	120	75	82	147	219
Coho Salmon	122	205	154	-	-	472	973	1,277	-	400	544
Arctic Grayling	264	1,953	8	372	228	631	2,352	2,552	8,643	1,045	1,227
Northern Pike	317	830	752	842	973	1,488	1,125	2,092	1,539	1,052	1,304
Sheefish	158	372	508	1,317	189	472	206	1,539	1,399	595	745
Dolly Varden	35	3,038	164	1,326	9	430	304	1,093	305	800	632
Holitna Total Harvest	1,024	6,633									
Total Harvest	4,734	11,302	6,550	10,572	6,507	8,137	9,294	16,091	19,001	9,148	10,120

of fish in the region. Recreational fisheries, while growing, continue to take a small portion of the annual harvest of fish in the area. For example, in 1998 the Kuskokwim River and Kuskokwim Bay recreational fisheries harvested an estimated 3,900 chinook salmon. This represents the largest estimated sport harvest of chinook salmon on record. In 1998 the subsistence fishery harvested an estimated 86,115 chinook salmon and the incidental harvest in the commercial fisheries was 44,402 chinook salmon (Appendix B1). The sport harvest of chinook salmon in 1998 represents less than 3% of the estimated total use of this species.

Fishery Objectives and Management

The sport fishery management objectives that have been identified are to: 1) manage sport fisheries for salmon in Kuskokwim River tributaries so that sport harvest do not threaten sustained yield from any stock; 2) increase public awareness of fishing opportunities; 3) improve access to salmon fishing locations; and, 4) achieve benefits to the angling public that outweigh the costs of management and research.

In comparison to commercial, and subsistence fisheries, sport fisheries for salmon in the Kuskokwim subarea of the AYKMA have very limited impact on the salmon stocks. Hence, there is very little effect that management of the sport fishery can have on the annual status of the various salmon stocks. Therefore, the goal of sport fishery management is to maintain a reliable level of opportunity for anglers to participate in the fisheries throughout the season. To this end, emergency actions to restrict harvest and/or season regulations for the sport fishery are generally not contemplated unless it becomes apparent that the size of the run is so small that restrictions in the subsistence fishery will be necessary.

The department carefully monitors all sport fisheries with the statewide harvest survey. Selected fisheries are closely monitored with creel surveys and other research projects. The Department of Fish and Game uses this information to remain responsive to changes in these fisheries. New regulations adopted by the Alaska Board of Fisheries during the winter of 1997-98 appear to have been sufficient and timely to address the growing sport fishing effort.

Two Emergency Orders were issued in 1999 that restricted sport fishing opportunity in the upper portion of the Kuskokwim River valley (tributaries upstream of the Aniak River).

- The chum salmon sport fishery was closed by Emergency Order on 17 July, 1999 for the entire Kuskokwim River and Kuskokwim Bay. This closure was due to poor returns drainage wide and was part of a coordinated conservation effort by Sport Fish and Commercial Fish divisions of ADF&G.
- The coho salmon sport fishery harvest limit was restricted from three to one fish by Emergency Order on 20 August, 1999. This order affected the entire Kuskokwim River and Kuskokwim Bay. This restriction was necessary because of poor return as indicated by assessment projects and by poor catch rates in fisheries in the lower portion of the drainage.

Fishery Outlook

Poor returns of chum salmon and lower than expected returns of chinook salmon in recent seasons in spite of good to excellent escapement of primary parent years results in a cautious and not overly optimistic outlook for Western Alaska salmon runs in 2000. A large degree of uncertainty exists concerning the ocean survival particularly for chum salmon. The outlook for coho salmon returning in 2000 is brighter than for other stocks. In 1996 record numbers of coho

returned to many Kuskokwim area streams. The primary parent year for 2000 production is 1996.

Continued pressure to restrict or close sport fisheries for salmon as restrictions in commercial fisheries occur can be expected. Once pre-season projections are obtained, management of sport fisheries may reduce bag limits at the beginning of the season so as to provide a continued level of opportunity for anglers throughout the season.

Recent Board of Fisheries Action

The BOF established bag and possession limits in 1987 for all salmon species throughout the drainage. Bag and possession limits for chinook salmon were revised downward to one per day in 1987 when status of local stocks of chinook was unquestionably depressed and maintenance of historic escapement levels were threatened. Between 1988 and 1994 the Kuskokwim Area chinook salmon populations increased along with guideline harvest levels for the commercial fishery. In 1994, the BOF reestablished the bag and possession limit for chinook to three fish with only two over 28 inches in length. In 1997 the BOF imposed a season restriction for chinook salmon in the Kuskokwim River drainage downstream and including the Holitna River drainage; open season is May 1 – July 25.

Current Issues

The primary issue that is likely to affect all users (including recreational anglers) of stocks of salmon in the Kuskokwim subarea is the assumption of management of subsistence fisheries by the federal government that occurred in October 1999. Recent decisions in federal courts have found that the navigable waters for which the federal government maintains a reserved water right are federal public land. As a result of this determination, the federal land management agencies assert the right to manage fish and wildlife resources to provide a rural subsistence priority. The state of Alaska also provides for a priority subsistence use of these resources but is unable to discriminate between rural and urban users due to constitutional restraints. There is widespread concern that federal management will result in loss of opportunity for non-subsistence uses of fish resources particularly recreational uses.

Increasing participation in area sport fisheries is a concern to local residents. Although site specific information is limited, all available information indicates that these low use, remote sport fisheries are in good condition.

Recommended Research and Management Activities

A need for information on the growth in the Holitna River sport fishery was identified. A creel survey and test fishing project was initiated in 1998. The goals of the creel survey were to describe the sport fishery in terms of angler demographics, the daily catch-per-unit-effort and the composition of the sport harvest. Test fishing was conducted to gather information on age and size composition of resident and anadromous species. A detailed description of this project are reported by Burr (1999).

Aerial surveys of the upper Kuskokwim during the chinook and coho seasons are recommended to provide information on the distribution of angling effort in the area. The SWHS results for 1998 indicate that the fishery is expanding into previously undocumented areas.

HOLITNA RIVER SALMON

Waters of the Holitna River drainage have supported most of the sport fishing effort and harvest that occurs in the Kuskokwim River drainage upstream of the Aniak River (Tables 7 and 8).

During the last five-year period 1993-1997, the Holitna River supported approximately half of the fishing effort, harvest and catch in the sport fishery occurring in the upper portion of the Kuskokwim drainage. Sport fisheries that target chinook salmon, coho salmon, sheefish and northern pike in the Holitna River have been identified and are described below.

The Holitna River drainage supports increasingly popular sport fisheries for chinook and coho salmon. Chum and sockeye salmon compose a small portion of the sport catch; harvest and use of these species is largely incidental to the effort directed toward chinook and coho salmon.

Fishery Description and Historical Perspective

The Holitna River is the most important stream for sport fishing in the upper portion of the Kuskokwim drainage because of the diversity and abundance of resident and anadromous species. The Holitna River is one of the most important producers of chinook, chum and coho salmon in the Kuskokwim drainage.

Chinook salmon begin moving into the Holitna River in late June with the peak number usually arriving sometime in early July. The number of sites or “holes” that provide excellent chinook salmon sport fishing in the Holitna River are quite limited. One site popular with local residents is actually downstream of the mouth of the Holitna River near Vreeland Creek, a small tributary of the Kuskokwim River. The most popular hole in the Holitna River is located just downstream of the confluence with the Hoholitna River. Other sites are located near the mouths of other smaller tributary streams farther up the Holitna River. These sites are well known to local anglers and a limited amount of guided fishing has occurred for many years. Historically, guides were either local or were guides from Southwestern Alaska that worked through local residents to provide services.

The Holitna River is experiencing a period of growth that began to accelerate in the mid 1990's. New sport fishing guides have moved into the area seeking quality salmon fishing opportunities in relatively uncrowded settings. The first permanent lodge was established on the Holitna River in 1994 or 1995 near the mouth of the Hoholitna River, one of the most popular sport fishing holes for chinook salmon in the lower river. The lodge and all onsite equipment was burned by an unidentified arson during the winter of 1997. Prior to the 1998 season the owners purchased another site in the vicinity and continued to provide outfitting, guided fishing and big game guiding services. There are presently about seven sport fishing guiding/outfitter businesses operating on the river. The volume of guided angling activity directed at chinook salmon has increased markedly according to local reports.

Guided activity decreases in mid July until coho salmon begin arriving in substantial numbers in early August. The sport fishery for coho salmon is far less concentrated than is the chinook fishery. Sites currently supporting guided coho sport fishing are found from near the mouth of the Holitna upstream to Titnuk Creek (approximately 55 river miles from the mouth). While a portion of guided visitors arriving in August and September travel to the Holitna River with sport fishing as their primary activity, a substantial portion of non-local residents visit to hunt caribou (August) and/or moose (September). For these visitors, fishing is a secondary activity.

Fly-in salmon opportunities also exist in the upper portion of the Holitna drainage. At least two guiding businesses provide day trips for chinook and/or coho salmon to upstream areas (Taylor Creek to Chuilnuk River), although the level of use is currently very limited. Air Taxi operators provide access to the headwaters of the Kogruluk River for visitors desiring to float downstream to a pick up point near the weir site. Angling for chinook salmon is a primary

activity for these visitors. Concern has been expressed by local residents over the potential for damage to spawning redds by visitors during the spawning season.

Recent Fisheries Performance

Estimates of fishing effort directed at individual species are not available from the SWHS. Total estimated fishing effort from the Holitna River in 1998 (912 angler days) was less than in the record high years of 1996 and 1997 but similar to the recent five-year average of 1,012 (Table 7). In recent years, the Holitna River has supported approximately half of the fishing effort, harvest and catch in the sport fishery occurring in the upper portion of the Kuskokwim drainage. However, in 1998 the Holitna River drainage supported only 28% of the effort and 12% of the harvest that occurred in the Upper Kuskokwim.

The SWHS estimated that only 54 chinook salmon were harvested in the Holitna River in 1998 (Table 7). The 1998 estimate was well below estimated harvests from 1996 and 1997 and only about half of the recent five-year average. Catch of chinook salmon (both harvested and released) in 1998 was estimated to be 335 fish (Table 8). During the last five-year period about 75% of all chinook salmon caught were harvested.

Through 1997, recent harvest estimates from the SWHS data clearly indicate an increased use of coho salmon by anglers in the Holitna River (Tables 7, 8). The high use of coho salmon in 1996 is not surprising given the record high passage of this species (50,555) through the weir during the 1996 season. However the record high sport harvest of 423 coho in 1997 during a weak season indicates a real increase in the level of use. The 1998 season was in marked contrast to recent trends; no harvest or catch of coho salmon from the Holitna River was reported.

The substantial decrease in use by anglers of the Holitna River that was indicated by the 1998 SWHS results is likely due to at least two factors. First, flood conditions existed through much of July and August 1998 resulting in poor conditions for angling. Secondly, the destruction of the only on river lodge during the winter of 1997 resulted in clients canceling planned trips. The clients assumed that the service provider would not be able to accommodate their needs in spite of the purchase and construction of new facilities.

Reports from local residents, fishermen and guides indicate that the levels of angling effort and harvest of salmon in 1999 from the Holitna River were less than experienced in the 1996-97 seasons. The Holitna River once again was in flood during most of the traditional chinook season. These environmental conditions together with poor returns of chinook, chum and coho salmon resulted in poor fishing opportunities. Guides reportedly either canceled trips or shifted clients to alternate locations.

Fishery Objectives and Management

The sport fishery management objectives that have been identified are to: 1) manage sport fisheries for salmon in Kuskokwim River tributaries so that sport harvest do not threaten sustained yield from any stock; 2) increase public awareness of fishing opportunities; 3) improve access to salmon fishing locations; and, 4) achieve benefits to the angling public that outweigh the costs of management and research.

Sport fisheries for salmon in the Holitna River drainage have very limited impact on stocks of salmon and are functionally insignificant when compared with subsistence fisheries that occur in the area and with commercial and subsistence fisheries that take place down stream in the Kuskokwim River. Hence, the management of the sport fishery has little real effect on the

annual status of the various salmon stocks. Therefore the goal of sport fishery management is to maintain a reliable, season long level of opportunity for anglers to participate in the fisheries. To this end, emergency actions to restrict harvest and/or season regulations for the sport fishery are generally not contemplated unless it becomes apparent that the size of the run is so small that restrictions in the subsistence fishery will be necessary.

The presence of the Kogrukluk weir in the upper portion of the system together with a long term data base provides a unique opportunity (for AYKMA) to assess catch and harvest with quantitative measures of run strength.

The department carefully monitors all sport fisheries with the statewide harvest survey. Selected fisheries are closely monitored with creel surveys and other research projects. The ADF&G uses this information to remain responsive to changes in these fisheries. New regulations adopted by the Alaska Board of Fisheries during the winter of 1997-98 appear to have been sufficient and timely to address the growing sport fishing effort.

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Fisheries Outlook

Recent poor production of salmon in spite of good to excellent escapement of primary parent years suggests in a cautious and not overly optimistic outlook for Western Alaska salmon runs in 2000. A large degree of uncertainty exists concerning the ocean survival of all salmon species but particularly of chum salmon. The outlook for coho in the Kuskokwim should be somewhat brighter. The primary parent year for the coho salmon return in 2000 will be 1996; record high returns were documented to Kuskokwim tributaries including the Holitna River in the 1996 season.

Continued pressure to restrict or close sport fisheries for salmon as restrictions in commercial fisheries occur can be expected. Once pre-season projections are obtained, management of sport fisheries may choose to reduce bag limits at the beginning of the season so as to provide a continued level of opportunity for anglers throughout the season.

Recent Board of Fisheries Action

A total of five proposals were submitted to the Alaska BOF during 1997 concerning use by anglers of the Holitna River. Two of these proposals sought to limit means of access for recreational anglers. The remaining proposals sought changes in sport harvest limits for three species including chinook. The shorted open season for chinook in much of the Kuskokwim system adopted in 1997 applies to the Holitna River fishery. A summary of changes in the regulation of Holitna River fisheries as a result of action taken by the AK BOF is listed in Appendix C2.

Current Issues

A certain level of resentment is present in local residents that have until the last few years enjoyed very low use by outside anglers of the Holitna River area during the summer salmon season. Increasing competition for the limited number of “holes” for chinook salmon fishing is likely to increase. At this time, the level of catch and harvest of salmon species by sport fishermen in comparison to use levels by commercial and subsistence fishermen is functionally insignificant. Without demonstrated local benefits and a sense of local control in the use of the local resources, expanding opportunity for anglers in this remote area will come at a high price in terms of social costs.

Recommended Research and Management Activities

A survey of the Holitna River sport fishery was conducted in 1998 (Burr 1999). This study found limited effort and harvest in 1998 but evidence of recent growth in participation in the sport fishing. Most new effort was from guided, non-local anglers. Most anglers were seeking chinook, coho, or pike. Information from this study along with information from the SWHS indicate that the sport fishery in the area is not likely to be a significant or immediate threat to the current populations of resident and migratory fish.

High catch and harvest of coho salmon documented in 1997 in spite of weak run strength together with increasing levels of fishing effort, indicate a rapidly changing sport fishery. Development since 1996 of on-site lodging facilities catering to anglers along with at least two new fish guiding business in 1998, indicate recent and continued growth. The department should continue to closely monitor the development of the Holitna sport fisheries. The presence of the Kogrukluik weir in the upper portion of the system together with a long term data base provides a unique opportunity (for AYKMA) to assess catch and harvest with quantitative measures of run strength.

It is recommended that a second creel survey with the goals of determining the proportions of fishing effort directed at key species, the proportion of guided and unguided effort, the demography of anglers participating in sport fishing activity, and angler behavior in relation to current bag and size limits be conducted prior to AYK BOF meeting scheduled for the winter of 2000-2001.

YUKON RIVER NORTHERN PIKE

Sloughs, interconnected lakes, and the lower sections of large rivers throughout most of the AYKMA are inhabited by northern pike. Lowland areas of the Yukon and Kuskokwim rivers are particularly noted for large northern pike. Northern pike are abundant in all parts of AYKMA containing appropriate habitat except on the North Slope of the Brooks Range, where distribution of the species is limited. On the North Slope northern pike have been documented only in the Ikpikpuk River on the Arctic coastal plain west of the Colville River, and in middle reaches of the Killik River, tributary to the Colville River (Bendock and Burr 1985). In recent years Yukon River tributaries have contributed 85 to 90% of the harvest of the species within AYKMA (Appendices A1, A2).

Fishery Description and Historical Perspective

Within the Yukon subarea, most catch of northern pike has come from five primary locations: the Porcupine, Dall, Nowitna, Koyukuk, and Innoko rivers. The Porcupine and Koyukuk rivers are the two largest first order tributaries of the Yukon River. Sport fishing within these

drainages is dispersed and site-specific fishing effort is light. The level of effort directed at northern pike in the Nowitna, Innoko and Dall rivers is relatively greater but are still characterized as remote, high quality low use fisheries.

Most fishing for northern pike occurs during the open water season. Pike are targeted in early summer immediately following spawning and throughout the summer months. Pike are often fished in the fall in combination with hunting activities. Some of the sport and subsistence harvest in the AYKMA is taken during winter months through the ice with hook and line gear.

Most of the sport harvest of northern pike is taken with hook and line. Spearing, bow and arrow, and hand jigging techniques are also legal means and account for a small proportion of the total harvest.

Historically, fishing for northern pike in the Yukon area has been conducted by Alaska residents near towns or villages or where access is provided by road and boat. New or recently reestablished sport fish guiding businesses are promoting opportunities to catch trophy pike in the Nowitna, Koyukuk, Kaiyuh/Kotol, Anvik and Innoko rivers. In these remote locations where sport fish guiding services have become available, most of the angling effort is by guided fishers and most of the guided fishermen are non-residents.

Recent Fisheries Performance

Little quantitative information is available concerning the status of northern pike stocks in much of the AYK management area, but because of limited access, fishing effort is light except on those stocks near towns and villages where angling and subsistence gill netting effort may be more intense.

Between 1989 and 1998 little change was observed in total harvest or catch from the Yukon River reporting area (Table 9). Harvest estimates for 1988-1997 averaged 2,843 compared with 2,173 for 1993-1997. Catch estimates during the most recent five-year period averaged 14,847 fish showing a large degree of catch and release fishing for this species (Appendix A1). While estimates of harvest of northern pike in the Yukon area show little recent change, estimates of catch of northern pike in 1997 and 1998 were higher than previously reported.

Northern pike populations close to the Yukon River Haul Road Bridge have experienced more angling pressure because the recent opening of the road has allowed easy boat access for Fairbanks area residents. The Dall River northern pike sport fishery has been the source of user conflicts and the focus of stock assessment and use survey studies in the last decade. This fishery is discussed separately in a later section.

Nowitna River

The Nowitna River is located approximately 130 km downstream from the mouth of the Tanana River. This major Yukon River tributary enters the Yukon River from the south. It was designated a Wild and Scenic River 1980. Most of the main stem and major tributaries are included in the Nowitna National Wildlife Refuge. Guided and unguided fishing effort is increasing by anglers targeting trophy sized northern pike in a wilderness setting in remote areas of AYK including the Nowitna River. During the most recent five-year period (1993-1997), estimated angler effort has averaged approximately 1,000 angler-days by about 300 guided and unguided anglers (Mills 1994, Howe et al. 1995 - 1999). The number of angling guides officially operating in the refuge has increased from zero in 1992 to six in 1997 (J. Goode, Koyukuk/Nowitna Refuge, Galena, personal communication). Sport fishing occurs throughout

Table 9.-Sport harvest of northern pike in the Yukon River drainage (1988-1998).

Harvest	Year											Averages	
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-97	1993-97
Yukon R. drainages (Ft. Yukon to Canadian Border)				-	103	121	153	-	71	73	91	74	84
Fortymile River	-	-	-	-	-	-	-	-	-	-	-	-	-
Charley River	-	-	17	-	9	38	-	-	-	-	-	6	8
Yukon R. drainages (Koyukuk R – Ft. Yukon)				3,102	1,955	671	673	759	178	893	1,531	1,176	635
Porcupine River	-	-	119	662	351	339	448	50	138	50	340	216	205
Chandalar River	-	-	-	-	196	-	-	30	-	21	-	25	10
Birch Creek	-	-	-	-	43	47	36	77	20	63	40	29	49
Beaver & Nome Crks	-	-	-	21	558	9	54	126	35	10	-	81	47
Dall River	418	125	372	554	342	352	215	350	274	639	227	364	366
Haul Road Streams	-	-	187	-	-	-	-	116	106	21	-	43	49
Nowitna River	982	548	118	1,617	196	63	161	302	274	230	347	449	206
Melozitna River	36	-	51	-	-	47	18	-	-	115	26	27	36
Koyukuk River	-	52	271	485	650	191	138	99	140	1,364	242	339	386
Yukon R. drainages (downstream from Koyukuk R.)				515	257	346	610	367	441	390	773	418	431
Nulato River	-	-	34	-	9	-	-	86	-	10	-	14	19
Anvik River	55	82	-	-	128	74	-	11	43	21	45	41	30
Innoko River	18	268	118	118	43	151	9	90	91	127	101	103	94
Andreafsky River	91	58	17	250	17	113	341	30	80	180	102	118	149
Total	3,526	3,516	2,474	4,454	3,590	2,347	1,968	1,937	1,690	2,923	2,446	2,843	2,173

the open water season, however, anecdotal reports indicate that the majority of the fishing effort and harvest occurs during September concurrent with hunting activities and within the lower 30 km of the river.

Estimated sport harvest of northern pike from the Nowitna River during 1998 was 347 fish. This level of harvest is similar to average harvest between 1988-97 (449 fish, Table 10). During this period, the estimated total catch has generally increased with the two highest estimates on record from 1995 and 1996 (3,049 and 3,798 fish). In 1998 catch was estimated at 2,106, consistent with average catch since 1991. Between 1993 and 1997, the Nowitna River accounted for 10% of the sport harvest and 18% of the total catch of this species for the entire Yukon River subarea.

During 1997, a study of the northern pike population inhabiting the lower 15 miles of the Nowitna River was conducted (Burr 1999). The goal of the study was to obtain current information on this pike stock. The study found large numbers of northern pike in mature age and size categories. Based on movements of individually marked fish, it appears that pike using the lower 20 miles of the river are part of a single large stock. The study concluded that the population is currently lightly exploited and that current levels of fishing pressure are within sustainable limits.

Innoko River

The Innoko River and its tributaries drain a large flat wetlands and the foothills of the Kuskokwim mountains. The Innoko River enters the Yukon River a few miles downstream from the village of Holy Cross. This river system with its extensive wetlands provides excellent habitat for whitefish and northern pike. The lower Innoko and this part of the Yukon River continue to produce some of the largest northern pike in the state. In about 1995 a new sport fish guiding business which caters to anglers seeking catch and release opportunities for trophy sized northern pike, began operating in the lower Innoko, using a large house boat as a movable base of operations. Nearby, on the Anvik River, a long-standing sport fishing lodge was renovated and reopened. More recently, additional smaller businesses have begun to provide sport fish guiding services in the Innoko system; two of these businesses are operated by residents of the Holy Cross area.

Sport fishing effort in the Innoko River has generally increased during the last decade, ranging from about 200 to more than 1,200 days of fishing effort (Table 10). During this time frame estimates of harvest of northern pike have changed little averaging about 100 pike per year. In contrast, estimates of total catch have generally increased, climbing from about 1,000 in 1990 to 3,000 in 1996 and 1997 to nearly 7,000 in 1998. Most of this increase probably has come from guided anglers taking advantage of the recently developed facilities and services.

Fishery Objectives and Management

Management of northern pike in most of the Yukon area is structured to encourage participation in the fishery through liberal harvest limits. These regulations reflect the light level of use of northern pike within the most of Yukon subarea. The liberal regulations also provide harvest opportunity with rod and reel gear for rural residents within the sport fish regulation framework.

In areas where more intensive fisheries are present, management is structured to 1) provide for conservative harvest and 2) to maintain historic size composition. In these higher use areas, bag limits are lower and a minimum length limit is used to restrict the harvest of large, adult northern pike (predominately females).

Table 10.-Total fishing effort, and northern pike catch and harvest from principal fisheries in Yukon River area, 1977-1998.

Year	Yukon	Dall River			Nowitna River			Innoko River		
	Total	Effort	Number	Percent ^a	Effort	Number	Percent	Effort	Number	Percent
Harvest										
1983	3,318	405	1,794	54.1	388	378	11.4	51	-	-
1984	2,960	1,428	1,752	59.2	122	78	2.6	35	13	0.4
1985	2,132	139	416	19.5	260	260	12.2	-	-	-
1986	3,470	596	1,407	40.5	245	489	14.1	31	-	0.0
1987	2,492	545	866	34.8	453	28	1.1	-	-	-
1988	3,526	217	418	11.9	946	982	27.9	164	18	0.5
1989	3,516	438	125	3.6	773	548	15.6	206	368	7.6
1990	2,474	273	372	15.0	652	118	4.8	415	118	4.8
1991	4,454	359	559	12.6	1,238	1,617	36.3	520	118	2.6
1992	3,590	224	342	9.5	491	196	5.5	53	43	1.2
1993	2,347	845	352	15.0	446	63	2.7	637	151	6.4
1994	1,968	455	215	10.9	733	161	8.2	93	9	0.5
1995	1,937	1,018	350	18.1	1,977	302	15.6	430	90	4.6
1996	1,690	455	274	16.2	10,082	274	16.2	1,005	91	5.4
1997	2,923	1,011	639	21.9	802	230	7.9	1,258	127	4.3
1998	2,446	422	227	9.3	845	347	14.2	854	101	4.1
Averages										
1987-97	2,843	530	365	13	914	449	14	478	103	4
1993-97	2,173	757	366	16.8	1,008	206	9.5	685	94	4.3
Catch										
1990	17,717	273	1,810	102	652	694	3.9	415	964	54
1991	13,895	359	1,029	7.4	1,238	2,749	19.8	520	1,544	11.1
1992	14,801	224	1,042	7.0	491	1,426	9.6	53	171	1.2
1993	13,502	845	2,645	19.6	446	1,362	10.1	637	1,661	12.3
1994	11,694	455	1,308	11.2	733	2,868	24.5	93	18	0.2
1995	15,828	1,018	2,463	15.3	1,977	3,049	19.3	430	1,039	6.6
1996	14,389	455	1,115	7.7	1,082	3,798	26.4	1,005	3,215	22.3
1997	18,820	1,011	3,001	15.9	802	1,818	9.7	1,258	3,067	16.3
1998	19,863	422	1,632	7.2	845	2,106	10.6	854	6,683	33.6
Averages										
1990-97	15,081	580	1,802	12	928	2,221	15	551	1,460	9
1993-97	14,847	757	2,106	14	1,008	2,579	18	685	1,800	12

^a Percent of total catch or harvest of northern pike in the Yukon area.

The department carefully monitors all sport fisheries with the statewide harvest survey to track levels of harvest and effort at various sites and to detect changes in the distribution of fishing sites. Selected fisheries are closely monitored with creel surveys and other research projects. Length composition is used as an indicator of stock status for northern pike populations; the presence of large size fish in samples is used as an indicator of lightly exploited riverine populations. The Department of Fish and Game uses this information to remain responsive to changes in these fisheries.

Fisheries Outlook

In most of the Yukon area, northern pike stocks are subjected to very light levels of use by recreational anglers. Northern pike are taken in subsistence fisheries but in most cases as part of the catch from netting directed at whitefish or salmon. Jigging for pike is a customary activity in certain areas. Overall, these northern pike stocks are only lightly exploited. Opportunity exists for a large amount of growth in the use pike in the area.

Increasing levels of fishing effort in the Innoko River fishery indicate that change in the management of this fishery is warranted to preserve the quality of the fishery. Changes in sport fishing regulations for the Innoko River are anticipated during the winter 2000 BOF meeting. We envision new regulations that would be consistent with other high use northern pike fisheries in the Yukon drainage

Recent Board of Fisheries Action

Current sport fishing regulations for northern pike in the AYKMA were established in 1987. Prior to 1987, there was no bag, possession, or size limits for northern pike within most of the AYKMA. Proposals submitted by ADF&G to and adopted by the Alaska Board of Fisheries in 1987 established the current background regulation of 10 per day, with no size limit for most of the Yukon, Kuskokwim and North Slope subareas. Because of concern for the maintenance of Yukon River northern pike stocks near the Dalton Highway bridge, the BOF adopted a more restrictive regulation of five per day, with only one fish over 30 inches for Yukon River tributaries between the Hodzana and the Tanana rivers.

Opening of the entire Dalton Highway to public travel in 1994 caused concern that increases in recreational use would result in localized depletions of fresh water fish populations in waters adjacent to the road way. The BOF addressed this concern in 1994 by adopting new regulations for many of the resident fish species in the highway corridor (Burr et al. 1998). The northern pike bag and possession limit was reduced to five fish with only one over 30 inches.

In the Kuskokwim area in 1997, the AK BOF restricted northern pike harvest and length limits to five fish with only one over 30 inches for the Kuskokwim drainage downstream of and including the Holitna River. This change was in response to public proposals concerning increased sport fishing use of the area and concerns over freshwater species including northern pike.

Current Issues

Growth of the guided sport fishery for northern pike in the Innoko, Anvik, and Andreafsky rivers is the source of concern with long term residents who express concern over the influx of non-local visitors. Many residents of the lower Yukon River and Yukon Delta hold traditional beliefs and live very traditional subsistence lifestyles. There is generally limited acceptance of catch and release fishing as practiced by many visiting anglers.

Stocks of northern pike in the Innoko River and surrounding area support both subsistence and high quality sport fisheries. With continued growth anticipated in both fisheries, stock status and movement information is needed to ensure these stocks can continue to support both fisheries.

Recommended Research and Management Activities

The northern pike sport fishery in the Yukon area appears to be in a period of significant change. The department will continue to closely monitor the levels of fishing effort, catch and harvest throughout the area with the intent of identifying additional sites for stock assessment.

In 1998 and 1999 samples of northern pike from the catch of the Innoko River sport fishery were measured and marked with uniquely numbered dart tags. This sampling was conducted with Department oversight by volunteers from the guiding industry from northern pike caught and released by clients. In 1998, 567 pike were tagged and released; 707 were released with tags in the 1999 season. Only 12 of fish marked in 1998 were recaptured in the 1999 sample. Samples examined in 1998 and 1999 included very large and old fish; maximum lengths exceeded 50 inches (total length) and estimated ages were greater than age-20. A small number of the tagged fish were captured and reported by subsistence fishers residing in area communities on the Yukon and Innoko rivers.

In up coming seasons, sampling and tagging efforts will be expanded with the goal of obtaining more representative information on the Innoko River northern pike stock. In addition, a major multi-year project using radio telemetry has been proposed to obtain information on 1) the seasonal movements of northern pike targeted in subsistence and sport fisheries, 2) the degree to which the two fisheries use the same or different stocks, and 3) the size composition of northern pike captured in the sport fishery.

Proposals to the BOF to restrict the sport fishing regulations are anticipated during 2000. These proposals will likely seek to limit harvest and provide special protection for the exceptionally large northern pike currently inhabiting the area. In addition, the Innoko River area will be included as a candidate site for consideration as a special management area for the purpose of providing continued catch-and-release trophy pike fishing.

DALL RIVER NORTHERN PIKE

Fishery Description and Historical Perspective

Construction of the Dalton Highway in the mid 1970's provided access to the Dall River for anglers. Since that time, a summer season sport fishery has developed which targets mostly northern pike. Local people have expressed concern over encroachment by outside visitors and by what they perceive as a depletion of resources particularly northern pike.

In 1987, residents of Steven Village proposed to the BOF that the northern pike fishery in the Dall River should be closed. The BOF responded to the proposal by restricting allowable harvest of northern pike in the Yukon River and its tributaries from the Tanana to the Hodzana River to five pike (one over 30"). In 1988 and 1989 ADF&G conducted a project designed to assess the population of northern pike residing in the Dall River (Arvey and DeCicco 1989; Arvey and Burkholder 1990). A reliable estimate of population abundance was not obtained because northern pike travel into and out of the Dall River during the open water season. The study found that northern pike caught in the Dall River travel within the Yukon River and its tributaries from as far downstream as Hess Creek and upstream of Stevens Village to at least Old Lost Creek. Data obtained in 1988 and 1989 on the size and age of pike using the Dall River during

summer indicate that a substantial portion of these fish were of large size and old age. The maximum estimated harvest of northern pike from the Dall River occurred in 1984 and was 2,480 fish (1,752 sport, 730 subsistence). All harvest estimates since that time have been less (Mills 1978-1994, Howe et al. 1995-1999). Based on these study findings, the Department concluded that the level of harvest occurring in 1988 and 1989 on this pike population that inhabits a huge geographic area was within sustainable levels.

The Dall River lies within the boundaries of the traditional lands claimed by Stevens Village. Local people continue to express concern about the long term impact of increased visitor use of the Dall River area. Stevens Village residents have alleged that non-resident anglers have damaged private property on the lower Dall River and have acted without respect for the river environment and for the fisheries resource. Waste of fish and other game animals has been reported. Local people are concerned that mortality associated with catch and release fishing may be substantial.

Following the 1989 study, additional information concerning the Dall River northern pike fishery was limited to results of the SWHS. These results found that the average harvest between 1988 (bag limit reduced) and 1994 was 361 fish per year compared with an average of 835 fish prior to 1988. The restrictive bag and size limit appeared to be controlling harvest. Total catch was estimated beginning in 1990 and these data showed up to 87% of the northern pike caught were released. The number of fish harvested did not appear to be increasing. Estimated fishing effort on the river remained stable between 1988 and 1992 varying between 217 and 438 days of effort. Estimated fishing effort in 1993 increased to 845 days, the highest since 1984.

In 1995 and 1996 Stevens Village submitted proposals to the Federal Subsistence Board (FSB) seeking to close the Dall River to hunting and fishing by all but qualified rural residents. The FSB took no action on the proposals primarily because the navigable water in the Dall River was not federal public land and was therefore not within the jurisdiction of the FSB.

During 1995, a project was conducted to again assess the sport fishery for northern pike in the Dall River. This project represented a cooperative effort by Stevens Village Council, the Yukon Flats National Wildlife Refuge and ADF&G. The project was designed to obtain quantitative information on the level and type of visitor use, fishing effort, and on the catch and harvest of northern pike from the Dall River. The study was also designed to provide a check on the use and harvest estimates provided by the SWHS.

The 1995 survey found that the use of the Dall River during the 1995 season was light (Burr and James 1996). The survey estimated that 330 people (92% non-local) visited the river in 107 boats and stayed for a total of 631 days. Local use was highest in June when 20% of visitors were from Stevens Village; local use dropped to a low level in July. Most (94%) of visitors came to fish for northern pike. Sport fishing effort was estimated to be 553 angler days by 300 anglers. Total catch was estimated at 1,325 northern pike of which 340 were kept and 985 were released. The ranges of lengths and ages sampled in 1995 are consistent with the ranges observed during the earlier studies. Estimates from the SWHS were consistent with estimates from the on site survey on the Dall River. The SWHS estimated that 494 anglers fished 1,018 days catching 2,463 northern pike and harvested 350 (Howe et al. 1996). Although the point estimates from the SWHS for each measure of the sport fishery were higher than the estimates from the 1995 on-site study, these differences were not functionally or statistically different (Burr and James 1996).

Recent Fisheries Performance

During the last five-year period (1993-1997) fishing effort at the Dall River was similar to the level estimated in 1995 during the on site survey (Table 10). Estimated angler effort in 1998 (420 angler days) was less than most other recent estimates.

Estimated harvests of northern pike from the Dall River have been higher than other Yukon area locations. Between 1993 and 1997, this fishery provided an average of nearly 17% of all pike harvested from the Yukon subarea. While pike harvests have in general decreased in the Dall River and in the Yukon area as a whole since 1987, the estimate for 1997 (639 fish) was the highest since restrictions in regulation were adopted in 1988. In contrast, the estimated harvest in 1998 was less (227 fish, 9% of Yukon area).

Catch of northern pike between 1990 and 1997 showed an increasing trend with the estimate for 1997 (3,000) exceeding all previous levels. As were estimates of effort and harvest, the estimated total catch for 1998 was lower than the recent five-year average.

Fishery Objectives and Management

The objectives for the Dall River northern pike fishery are to 1) allow a conservative level of harvest while 2) maintaining historic size (and age) composition and to 3) maintain sport fishing opportunity for all participants.

Daily bag and possession limits were restricted in 1987 to allow for only one pike over 30 inches with a total bag of five fish. Subsequent studies and results from the SWHS indicated that harvest levels have largely been controlled by the regulations. The Department will continue to closely monitor SWHS results to detect major changes in the level of participation.

Fisheries Outlook

No change in the regulation of the fishery is anticipated for the 2000 fishing season. Proposals to further restrict harvest opportunities by eliminating harvest of large fish will be considered during the winter 2000/2001 BOF meeting. Consistent with catch and release regulation, gear restrictions including the elimination of bait and set lines will likely be proposed.

Recent Board of Fisheries Action

Two proposals were submitted concerning the Dall River sport fishery in 1997; one by Stevens Village the other by the Yukon Flats Fish and Game Advisory Committee. Both proposals sought to place further restrictions on sport fishing, citing harvests in excess of sustainable levels. The SWHS results and the results of the field studies conducted in 1988, 1989 and 1995 showed no indication of excessive harvests. There was no new information indicating that recent harvest levels had increased above sustainable levels. The BOF took no action on either of the proposals except to repeal an outdated subsistence fishing closure.

Current Issues

The Stevens Village Resource Office aggressively enforced trespass violations on private land (native allotments, corporation lands) during 1998. Representatives from the village talked with anglers about land status, discouraged them from fishing in the area and in a few isolated instances removed legal fishing gear from the water. The reduction in participation by anglers in the Dall River fishery that is indicated by the 1998 results from the SWHS may be an effect of the field activities conducted by Stevens Village personnel.

Residents of Steven Village continue to express concern over the increased level of use by non-locals that has occurred since the construction of the Dalton Highway bridge. The village

continues to seek recognition of the Traditional Use Lands described in “A Comprehensive Land Use Plan for the Traditional Lands of Stevens Village”. The Dall River is an important traditional site to residents of the village and the loss of control is a source of conflict. While there is wider acceptance that the level of harvest occurring at the Dall River is sustainable, local people assert that the quality of the northern pike stock as reflected by age and size composition has decreased from historic levels. The Stevens Village Natural Resource Office has expressed a willingness to provide improved access to certain private lands adjacent to the Dall River concurrent with tighter controls on the sport fishery and potential local benefits.

In October 1999, the federal government asserted the right to manage fish and wildlife resources in certain navigable waters for the purpose of providing a rural subsistence priority. Waters within federal conservation units are now defined as federal public land. The FSB took no action on earlier proposals that sought to close the Dall River to hunting and fishing by all but qualified rural residents. This was primarily because the navigable water in the Dall River was not within the jurisdiction of the FSB. The Dall River lies within the boundaries of the Yukon Flats National Wildlife Refuge. Nearly all of the lands adjacent to the river have been selected by the regional corporation (Doyon), by the Village corporation (Dinyee) or as individual native allotments. The potential for non-local anglers losing the opportunity to participate in sport fishing within the Dall River has greatly increased with the expanded jurisdiction asserted by the federal board.

Ongoing and Recommended Research and Management Activities

The Stevens Village council has shown a renewed desire to work toward a mutually agreeable solution to the issues surrounding the Dall River sport fishery. A Dall River Working Group comprised of ADF&G (Sport Fish Division), the Stevens Village Natural Resource Department (SVNRP) and the Yukon Flats National Wildlife Refuge has initiated the cooperative development of a fishery management plan (FMP) for the Dall River. All parties are concerned with the maintenance of a viable quality northern pike stock in the Dall River drainage. Successful development of this plan will require the involvement of all interested users.

A primary option under consideration as part of the FMP is the establishment of a special management area in which large sized northern pike would be provided additional protection by eliminating or greatly restricting the harvest of large fish beyond a certain length. To measure the feasibility of this approach, a field project was conducted in 1999 and will continue through 2000. The goals of the study are 1) to determine the degree to which pike remain within the Dall River drainage throughout the fishing season, and 2) to estimate the current size composition of northern pike inhabiting the area. This field project was planned and is being conducted jointly by ADF&G, SVNRP and the USF&WS (Yukon Flats Refuge).

Preliminary results from the first season of the study indicate that most northern pike captured within the Dall River in early summer remained within the drainage during the fishing season. Size composition of northern pike estimated from samples collected during the 1999 season indicate that the proportion of fish larger than 30 inches (total length) has decreased to a small degree from estimates from 1988. However, a substantial number of large (>30 in.) fish are still present. If further analysis of these data and data from the 2000 season confirm initial conclusions, the establishment of Dall River special management area for the purpose of providing a catch and release fishery for large northern pike will be a viable option.

Proposals to the BOF are anticipated for consideration during the winter 2000/2001 meeting. The proposals will seek to establish special regulations for the Dall River area for the purpose of providing additional protection for large northern pike.

YUKON RIVER ARCTIC GRAYLING

Fishery Description and Historical Perspective

Grayling are distributed throughout the entire drainage, from extreme headwaters in Canada to streams that originate in the Yukon Delta. Sport fishing effort is likewise widespread. Historic documentation of harvests (Mills 1977-1994; Howe et al. 1995-1999) indicates that the heaviest sport utilization has occurred on Koyukuk River tributaries, including those that are crossed by the Dalton Highway. Road access has also recently been provided to Nome and Beaver creeks. Virtually all other grayling harvests in the drainage are from streams that have no, or very limited, road access. Historic sport effort and harvests are estimated to be small relative to road accessible streams (Table 11).

Dalton Highway. Arvey et al. 1995 reported that most of the harvest of Arctic grayling from the Koyukuk drainage was from streams and lakes adjacent to the Dalton Highway. This conclusion was based on best available information from responses to the SWHS. Most responses simply listed "Koyukuk River tributaries" as the location fished for grayling; assumptions on the geographic distribution of that effort and harvest were based on relatively few site-specific responses. More recent information (since 1995) indicates that about 10% of the harvest and 14% of the catch of grayling from the Koyukuk drainage comes from Dalton Highway streams (Howe et al. 1996-1999). Still, given the relatively small portion of the Koyukuk drainage that is accessible from the roadway, grayling stocks along the Dalton Highway are likely subjected to the highest use by anglers in the drainage.

Management of Arctic grayling stocks along the Dalton Highway has been based on the concept that large portions of the grayling stock(s) are not readily available to anglers and will replace any localized depletions that might occur near the highway. Nearly all of the fishery occurs within a short distance of the road bed (1/4 mile or less, Bendock 1982, 1983). If localized depletions of grayling near the roadway do occur during a particular season, the negative result would be to reduce angler opportunity but would be unlikely to be cause for concern for the viability of the stock(s). This strategy assumes that a pool of catchable sized fish exists to replace harvested fish before the next fishing season.

The Jim River supports the largest regional stock, as well as the largest harvest by sport anglers (Fish 1997). The Jim River is one of the most accessible of the streams crossed by the Dalton Highway because the roadbed parallels the stream for many miles. In contrast, most other streams in general flow perpendicular to the roadbed. Between 1995 and 1997 studies were conducted to obtain baseline abundance and composition data for stocks of Arctic grayling in rivers and streams crossed by the Dalton Highway. Studies concluded that catchability of fish in the Jim River is not affected by accessibility from the highway, and that fishing pressure at easily accessible locations along the river is probably not great enough to cause changes in catchability throughout the summer.

A study of the movement of grayling captured in the Jim River summer fishery was conducted in 1997 and 1998 using radio telemetry. The goals of the study were to locate spawning and overwintering habitats of grayling and to determine the fidelity of Arctic grayling to summer feeding grounds in the Jim River. The study (Fish 1998) found that most fish tagged in the Jim

Table 11.-Sport harvest of Arctic grayling in the Yukon River drainage (1977-1998).

Harvest	Year											Averages	
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-97	1993-97
Yukon R. drainages (Ft. Yukon to Canadian Border)				553	992	183	899	528	177	1,062	702	628	570
Fortymile River	73	83	34	218	317	587	190	517	56	73	519	215	285
Charley River	36	120	17	129	383	54	416	18	37	461	152	167	197
Yukon R. drainages (Koyukuk R – Ft. Yukon)				2,624	701	789	744	466	861	1,771	2,434	1,137	926
Porcupine River	-	104	203	1,119	180	221	255	237	385	99	270	280	239
Chandalar River	218	31	592	257	253	50	-	-	-	-		150	-
Birch Creek	-	625	85	51	38	420	16	6	-	3	174		
Beaver & Nome Crks	255	-	-	141	323	171	306	53	694	79	373	202	261
Dall River	-	-	-	129	15	-	-	-	-	39	-	72	39
Haul Road Streams	-	-	-	-	-	-	-	217	229	188	242	-	211
Nowitna River	-	-	-	-	-	-	-	-	-	114	177	28	23
Melozitna River	-	354	17	129	68	19	-	18	-	69	-	67	21
Koyukuk River	3,439	3,674	2,827	1,582	985	716	2,015	1,174	1,134	1,233	811	1,878	1,254
Yukon R. drainages (downstream from Koyukuk R.)				708	325	558	147	334	410	181	885	380	326
Nulato River	-	167	-	26	68	-	-	35	112	69	48	48	43
Anvik River	910	21	-	154	143	71	10	52	251	-	422	161	77
Innoko River	-	166	-	-	-	-	-	-	121	30	-	166	76
Andreafsky River	-	82	169	193	38	299	98	62	47	20	84	101	105
Total Harvest	6,115	7,491	4,961	5,570	4,171	3,330	4,574	3,421	3,728	3,139	4,022	4,650	3,638

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Table 11.-Page 2 of 2.

Catch	Year										Averages		
	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1988-97	1993-97
Yukon R. drainages (Ft. Yukon to Canadian Border)				1,966	1,661	418	2,186	765	1,000	3,261	13,88	1,608	1,526
Fortymile River			356	771	880	1,115	279	1,015	420	570	721	676	680
Yukon R. drainages (Koyukuk R – Ft. Yukon)				7,242	2,315	5,845	3,286	2,013	4,778	10,955	10,670	5,205	5,375
Beaver & Nome Crks				219	1,300	274	2,417	957	4,009	2,004	1,777	1,597	1,932
Haul Road Streams								648	949	897	1,696	-	831
Yukon R. drainages (downstream from Koyukuk R.)				9,041	4,478	4,491	1,705	1,145	2,172	1,427	6,715	6,494	2,188
Total Catch			34,299	23,458	17,300	21,420	15,951	11,454	19,891	16,401	18,773	20,022	17,023

River remain in the Jim River through the winter. A smaller proportion (about 35%) wintered in other locations including the South fork of the Koyukuk, the Middle Fork Koyukuk River and Prospect Creek. During the spawning season, most grayling were located in the Jim River in either the fishery area or in the lower Jim River. Some fish (< 20%) were located during the spawning season in Fish Creek, Prospect Creek, and the South Fork Koyukuk River. The migration characteristics and patterns of habitat use are very similar to those of other stocks of grayling inhabiting other clear water rapid runoff rivers in Interior Alaska (Tanana Valley). This study suggests that Arctic grayling in the Jim River are probably a distinct stock of fish that may share overwintering and feeding habitat with other related Koyukuk River stocks.

In 1997 and 1998 a study using radio telemetry was initiated to determine overwintering and spawning locations of Arctic grayling marked in the Jim River summer fishery, and to determine the fidelity of Arctic grayling to summer feeding grounds in the Jim River. The study (Fish 1998) found that most fish (66%) tagged in the Jim River overwinter in the Jim River (53% downstream of the fishery) while fewer overwinter in the South Fork Koyukuk River (25%), the Mainstem Koyukuk River (8%), and Prospect Creek (3%). During the spawning season, most grayling (84%) were located in the Jim River, within the fishery area (37%), or in the lower Jim River (47%). A few fish were also located during spawning season in Fish Creek (7%), Prospect Creek (3% one fish), and the South Fork Koyukuk River (7%). Patterns of habitat use and migration characteristics appear to mimic those of other stocks of Arctic grayling inhabiting unsilted, rapid runoff rivers in Interior Alaska (e.g. within the Tanana Valley). Telemetry data suggest that Arctic grayling in the Jim River are probably a distinct stock of fish that may share overwintering and feeding habitat with other related Koyukuk River stocks.

Nome/Beaver Creek. Excellent access has been provided to Beaver Creek by way of the improved road to Nome Creek. Beginning in the early 1990's, BLM upgraded the road bed and initiated construction of multiple campgrounds. In 1999, construction of the campgrounds and the expanded road system leading to Nome Creek and its confluence with Beaver Creek was completed. This road system is located near the Fairbanks population center and has resulted in increased visitor use and in increased catch of Arctic grayling in this area.

Baseline studies conducted by BLM during the late 1980's indicated a very small resident grayling population in Nome Creek. Concern over increased fishing effort and potentially high levels of exploitation of the grayling stock in this 3rd order tributary prompted the ADF&G to propose increasingly restrictive regulations for Nome Creek culminating in the current catch and release only regulation that was adopted in the winter 1994-95. The background regulation of 10 per day without size limit applies to the remainder of Beaver Creek

Recent Fishery Performance

The Yukon subarea has provided about 65% of the sport harvest and 40% of the catch of Arctic grayling in the AYKMA during the 1987-1997 period (Table 2, Appendix A1). Estimated average harvest in the most recent five-year period was 3,638 fish which reflects a moderate decrease over historic levels (4,650 fish, 1988-1997). In 1998, an estimated 4,000 grayling were harvested from the Yukon area (Table 11). Catch estimates for the Yukon subarea have averaged about 20,000 annually since 1990; estimated catch in 1998 was approximately 19,000 grayling (Table 11). These data reflect a continued low level of use of the species in the Yukon area as a whole.

Dalton Highway. Sport Fisheries for Arctic grayling in the Yukon area along the Dalton Highway have harvested an average of 211 fish annually since 1995. Estimated grayling harvest in 1998 was similar to recent levels and was estimated to be 242 fish of which 195 came from the Jim River (Table 11). Total estimated catch from this area since 1995 has averaged 831 grayling which nearly doubled in 1998 to an estimated 1,696 grayling (1,264 from Jim River). These results indicate an increasing trend in catch and release use of grayling for this roadside fishery. There is no apparent increase in harvest of grayling from this roadside fishery.

Nome/Beaver Creek. The SWHS combines Beaver Creek and Nome Creek and reports results as a single location. The estimated annual catch of Arctic grayling from Nome and Beaver Creeks averaged approximately 2,000 fish for the most recent five-year period (Table 11). Estimated catch from 1996 (4,009 fish) is the highest on record for this fishery. The estimated catch of about 1,800 grayling for the 1998 season likely reflects the flood conditions that characterized the river system during much of that summer. Harvest of Arctic grayling from Beaver Creek (Nome Creek is closed to harvest) has average only 260 fish during the recent five-year period but record estimated harvests of approximately 700 and 400 grayling were reported in 1996 and 1998 (Table 11). Although results from the SWHS for the 1999 season will not become available until mid summer 2000, angler and other anecdotal reports indicate that use of the Nome Creek and Beaver Creek increased in 1999 over recent seasons with the completion of the access road and campgrounds.

Fishery Objectives and Management

Dalton Highway. The objective of management for the Dalton Highway grayling fishery is to provide a conservative level of harvest while maintaining historic size composition.

Results from the SWHS will be used to monitor harvest of grayling from the Dalton Highway. The Jim River supports the largest affected stock and most of the harvest of this species in the corridor. Estimated harvest from the SWHS in excess of 1,200 grayling from the Jim River will trigger field assessment of this stock. The 1,200 fish threshold harvest level is based on a 10% exploitation rate of the estimated abundance from 1997-98 studies. Recent estimates indicate that about 200 grayling are harvested annually.

Nome/Beaver Creek. The fishery objective for Nome Creek is to preserve historic abundance and size composition of Arctic grayling within this small tributary of Beaver Creek with a catch and release fishery. For Beaver Creek the goal is to provide a conservative level of harvest while maintaining historic size composition.

The current regulation for Beaver Creek is 10 per day without size limit. This regulation is appropriate for remote grayling fisheries with dispersed and hence low levels of fishing effort. The road and campground construction that was completed during 1998 and 1999 has changed the level of access and the nature of the fishery. To attain the goal of maintaining historic size composition while providing for a conservative level of consumptive use, regulations should be modified to reflect the change in the fishery.

Fishery Outlook

Dalton Highway. Changes in fishery regulations for the 2000 season are not expected for Nome Creek or for Beaver Creek. Modest increases in visitor use have been recorded at the visitor center in Coldfoot (BLM). Dramatic increases in the fishery are not anticipated in the upcoming season.

Nome Creek/Beaver Creek. Changes in fishery regulations for the 2000 season are not expected for Nome Creek or for Beaver Creek. Restrictions in the allowable bag limit for Beaver Creek are anticipated during the winter 2000/2001 BOF meeting. The intent of these changes will be to bring regulations for Beaver Creek in line with other grayling fisheries for which good access is available.

Recent Board of Fisheries Action

Dalton Highway. In 1994, the BOF reduced the bag and possession limit for grayling within the Dalton Highway Corridor from 10 to 5 fish and added a minimum length limit of 12 inches total. This action was taken in response to increases in recreational use and harvest (Burr et al. 1998).

Nome Creek/Beaver Creek. During 1994, the BOF adopted a catch and release only regulation for grayling in Nome Creek in anticipation of continued increasing recreational use of this small tributary of Beaver Creek.

Current Issues

Dalton Highway. Local roadside depletion of fish stocks near crossings of Koyukuk River tributaries by the Dalton Highway have been of concern, since such depletions reduce angling opportunity for sport fishers traveling the route. Bag and possession limits were reduced to alleviate harvest pressure in the immediate road crossing areas.

Nome/Beaver Creek. Improved access to Beaver and Nome creeks has resulted in a rapidly growing sport fishery for Arctic grayling.

Recommended Research and Management Activities

Dalton Highway. The concept of “localized depletions” of Arctic grayling within the Dalton Highway corridor continues to be difficult to monitor and/or compensate for with management action given the limited information that exists for these stocks. The current regulations include a size-restricted bag limit of five fish per day. Size-restriction is borrowed from knowledge of Tanana Valley stocks, and is founded on the assumption that Arctic grayling will have the opportunity to mature, spawn and contribute to the population before being harvested as a 12-inch, or larger, fish. However, the effectiveness of this assumption has not been verified for stocks within Dalton Highway drainages. Modeling of growth data indicated that Arctic grayling sampled in the Jim River during 1995, grow slower than Arctic grayling in the Lower Chena River in the Tanana Valley. This study predicted that grayling at age-6 (the age at which Arctic grayling are assumed to be sexually mature) would be 273 mm FL (about 12 in.). Conducting studies to validate the age and size of maturity are planned for the 2000 season and will provide data to evaluate the rationale behind the 12 inch minimum size restriction of the current regulations.

At present, there appears little concern for overharvest in streams crossed by the Dalton highway, but the phenomenon of localized depletions is still poorly understood. If fishing effort or harvests of Arctic grayling increase, a better understanding of population dynamics of Dalton Highway Arctic grayling stocks, and how they differ from Tanana Valley stocks, will be necessary to allow for more effective management of this species within this region of the State.

Patterns of movement and of seasonal use in the Jim River indicate that Arctic grayling would be at the greatest risk of exploitation during late May and early June when they are on separate spawning grounds. However, fishing effort along the Dalton Highway appears to be most intense during July and August (summer months), while fishing effort during spring spawning

periods is probably very low. When grayling harvests increase to the level that triggers stock assessment, this field assessment should include creel surveys to better characterize the nature of these roadside sport fisheries.

Nome/Beaver Creek. An assessment of the Arctic grayling stock inhabiting Beaver Creek prior to the AYK BOF meeting scheduled for the winter of 2000-2001 is currently under consideration. We currently possess no data on age and size, growth rates or the abundance of grayling in the upper portion of Beaver Creek (area accessed from Nome Creek). Information on this stock will facilitate evaluation of possible size and limit restrictions and assist in developing regulatory proposals for this growing fishery. The Department will likely propose more restrictive regulatory options for Beaver Creek based on continued increases in use by anglers.

NORTH SLOPE DOLLY VARDEN/ARCTIC CHAR

Fishery Description and Historical Perspective

In the AYKMA, Arctic char occur in lakes in the Brooks Mountain Range and in some headwater lakes in the Kuskokwim River drainage. Dolly Varden, a closely related species, are common inhabitants of most large rivers on the North Slope in most drainages of the eastern coastal plain from the Canadian Border to the Colville River. The species is widely distributed throughout the Kuskokwim and Yukon drainages as well. The Department groups Dolly Varden and Arctic char together for regulatory purposes. However, the two species have distinct life history traits. Distribution of Arctic char is very limited in the AYKMA and the vast majority of fisheries are directed toward Dolly Varden. For the purposes of the following discussion this species complex will be referred to as “char”

In most of the AYKMA char provide a minor contribution to the total catch and harvest in comparison to other species. In the upper Kuskokwim (upstream of the Aniak River) char have contributed only 6% of the harvest and 4% of the catch to the Kuskokwim drainage totals. In the Yukon drainage char contribute only about 5% of the catch and harvest to the total numbers in the drainage. In contrast, char are a major component of the catch and harvest in the North Slope area contributing more than 40% of the harvest and nearly 30% of the catch (Table 12, Appendix A4). On the North Slope most sport fisheries for char target overwintering populations of Dolly Varden either in the fall as the fish return to freshwater from the sea, or in the spring as they move toward the sea to feed.

On the North Slope, char spawn and overwinter in spring water upwelling areas. The char become increasingly concentrated in the spring areas beneath and adjacent to the in-river glaciers (aufeis) that form during winter. Streams that are known to support significant populations of char include the Kongakut, Hulahula, Canning, Sagavanirktok, and Anaktuvuk rivers. Overwintering locations are in some cases different from spawning locations such that non-spawning fish from several neighboring tributaries may concentrate in a single drainage. The upper Ivishak River, a tributary of the Sagavanirktok River provides a large overwintering area used by fish in non-spawning years from nearby tributaries such as the Ribdon, Lupine and Echooka rivers.

The population of char using the Sagavanirktok River is considered particularly vulnerable because of potential habitat degradation resulting from oil and gas development that has occurred in Prudhoe Bay (Sagavanirktok River Delta). Access for anglers to the migratory route of this stock is provided by the Dalton Highway which parallels most of the main stem of the

Table 12.-Sport fishing effort, and harvest and catch of principal species in the North Slope subarea.

Year	Angler-Days		Lake Trout		Char		Arctic Grayling	
	Total	Haul Road	Total	Haul Road	Total	Haul Road	Total	Haul Road
Harvest								
1977	2,434		88		241		1,239	
1978	1,422		9		181		678	
1979	1,526		264		364		1,382	
1980	2,142		379		827		1,765	
1981	2,601		454		1,188		2,904	
1982	4,879		629		2,065		4,077	
1983	5,738	911	367	31	2,966	105	2,884	524
1984	8,344	1,620	481	416	1,507	351	2,441	1,247
1985	4,490	1,558	1,707	37	3,489	296	5,382	2,078
1986	4,779	842	415	-	983	322	4,099	907
1987	5,256	2,278	274	50	2,676	1,560	1,932	1,065
1988	2,541	1,265	73	73	1,018	327	983	528
1989	4,118	1,266	482	149	1,031	241	2,113	993
1990	3,764	2,502	168	118	489	219	791	554
1991	7,291	3,535	176	-	1,199	640	3,301	1,921
1992	4,940	2,211	379	293	836	336	1,145	324
1993	5,600	3,421	106	57	1,092	623	1,632	547
1994	5,407	2,926	73	73	589	451	807	371
1995	5,644	3,275	38	38	896	437	983	579
1996	6,205	3,524	18	-	887	426	753	253
1997	5,987	3,800	40	40	741	367	1,071	373
1998	4,253	2,418	243	144	1,450	1,070	1,207	625
Average								
1977-86 (%)	3,836		479 (9)		1,381 (27)		2,685 (52)	
1987-97 (%)	5,159 (100)	2,728 (53)	166 (6)	81 (49)	1,041 (38)	512 (49)	1,410 (52)	683 (48)
1993-97 (%)	5,769 (100)	3,389 (59)	55 (3)	42 (76)	841 (41)	461 (55)	1,409 (51)	425 (40)

-continued-

Table 12.-Page 2 of 2.

Year	Angler-Days		Lake Trout		Char		Arctic Grayling	
	Total	Haul Road	Total	Haul Road	Total	Haul Road	Total	Haul Road
Catch								
1990			1,728	1,225	3,744	1,141	5,842	3,240
1991			932	161	2,670	1,635	9,200	4,668
1992			887	556	3,850	1,769	6,608	2,135
1993			266	180	3,946	2,454	9,345	5,505
1994			327	316	3,178	2,371	8,552	5,165
1995			370	319	3,229	1,780	5,427	3,828
1996			781	763	4,811	3,778	6,286	3,608
1997			110	76	2,881	1,462	13,163	7,364
1998			1,367	810	7,677	3,880	7,713	3,623
Average								
1990-97 (%)			675 (5)	450 (67)	3,539 (28)	2,049 (58)	8,053 (64)	4,439 (55)
1993-97 (%)			371 (3)	331 (89)	3,609 (28)	2,369 (66)	8,555 (66)	5,094 (60)

Sagavanirktok River. In 1994, the entire length of the Dalton highway was opened to public travel. Prior to this, the North Slope portion of the road was technically open only as far north as the Wiseman area in the upper Koyukuk drainage.

Aerial surveys of index areas in the Ivishak River were initiated in 1971 and attempted annually through 1984 as a means of monitoring changes in this stock. The number of char counted in the Ivishak index area ranged from about 8,000 to as many as 36,000 in the 12 years the survey was conducted (Appendix D). In 1989, 1993, and 1995 the survey was again conducted; counts were 12,650, 3,057, and 27,036 char. The low estimate from 1993 was conducted at least two weeks earlier than other counts and it is likely that many of the fish had not completed the upstream migration. The most recent count of 27,036 is similar to counts obtained between 1979 and 1984.

In the Anaktuvuk River drainage, an index area was established in 1979 and annual counts were attempted through 1984 (Appendix D). Counts ranged from 15,717 to 5,462, declining each year. In 1989 anecdotal reports from local residents and long-time users of this stock indicated that the fish were not present in traditional areas including the overwintering/spawning area near Rooftop Ridge (index area). The primary users of char from this area are Barrow residents that fly into a nearby privately owned airstrip. ADF&G personnel planned to conduct an aerial survey of the Anaktuvuk River in 1989 but the survey was not conducted due to weather conditions. No survey of the Anaktuvuk River char stock has been completed since 1984. Recently, anecdotal reports from local users indicate that the numbers of char in the Anaktuvuk River have returned to “normal” levels in traditional areas.

The Kongakut River is a popular destination for float trips in the eastern most part of the Arctic National Wildlife Refuge (ANWR). Concern by refuge staff and members of the public over perceived declines in the number of char available during summer resulted in a joint project to assess this stock. In 1995, the project attempted to estimate abundance of char in a section of the river. However, too few fish were captured during the summer sampling period. ADF&G conducted an aerial survey in September of 1995 to determine if there had been a substantial decrease in the number of spawning and overwintering fish that were using the river. The count in 1995 was 14,080 substantially greater than the other two estimates available (Appendix D).

Recent Fishery Performance

Estimates of catch and harvest of char from the North Slope subarea through 1997 showed a stable level of use. However estimates for 1998 are higher (Table 12). Harvest in 1998 was estimated to be 1,450 char of which 1,070 (74%) were taken from the Dalton Highway corridor. Catch was estimated to 7,677 fish of which nearly 4,000 came from the road corridor. The catch estimate is the highest on record and the estimated harvest is the greatest in more than a decade. Recent increases in fishing effort (directed at all species) are more modest.

A large increase in fishing effort and catch of char and the other two key sport species (Arctic grayling and lake trout) was anticipated with the opening of the entire length of the Dalton Highway to public travel in 1994. Until 1998, estimates from the SWHS did not indicate that this occurred (Table 12).

Estimates from the 1998 SWHS are consistent with anecdotal reports from oil field workers and observations by other state personnel working in the area. These reports indicate that in 1998 the amount of sport fishing effort directed at char along the causeways in Prudhoe Bay and at migrating char in the Sagavanirktok River near the Dalton Highway increased.

Fishery Objectives and Management

Fishery objectives for char reflect the different life history characteristics that these two closely related species exhibit. Dolly Varden (which inhabit streams and are often anadromous) can be exploited at much higher rates than can lake dwelling Arctic char. The life history characteristics of lake dwelling Arctic char are very similar to lake trout and these populations can support only low rates of exploitation.

In lakes (primarily Arctic char) char are managed to provide a conservative level of yield. In streams (primarily Dolly Varden) char are managed to encourage participation in the fishery while limiting harvest of spawning adults.

Fishery Outlook

Char will likely continue to provide a substantial portion of the sport fishery that occurs on the North Slope. Reports from anglers indicate that the fishing for char in the Prudhoe Bay area and along the Sagavanirktok River increased in 1998 and 1999. Recent results from the SWHS also indicate an increased level of use. Participation in this fishery is likely to continue to increase.

No changes in the regulation of this fishery are expected prior to, or during the 2000 season. Proposals to the AK BOF are not anticipated at this time. However, new projects planned for the 2000 season may result in a further restriction in the char fishery in lakes within the Dalton Highway corridor.

Recent Board of Fisheries Action

In 1994, the BOF adopted new regulations for Dolly Varden and Arctic char for the entire AYK region. It is extremely difficult to distinguish between Dolly Varden and Arctic char in the field. However these two species have substantially different biological characteristics and cannot withstand the same exploitation rates. Dolly Varden (which inhabit streams and are often anadromous) can be exploited at much higher rates than can lake dwelling arctic char.

The BOF adopted the following regulations: in flowing waters the bag and possession limit for these species is ten per day with only two over 20 inches in length; in all lakes the bag and possession limit is two per day with no size limit.

Current Issues

There is a concern among indigenous people of the North Slope that a growing sport fishery for char may conflict with local subsistence fisheries.

Oil and gas development adjacent to and within the migration routes of char in North Slope carries the potential for serious impacts through contamination of habitat. Char using the Sagavanirktok drainage pass through Prudhoe Bay, one of the most heavily industrialized areas in Alaska. Current plans for oil and gas leases in the foothill region of NPRA are of particular concern. These new lease areas include the critical overwintering/spawning habitat in the spring areas of the Anaktuvuk River drainage.

Ongoing and Recommended Research and Management Activities

Results for 1999 from the statewide harvest survey will be closely examined to monitor changes in the level of use of Prudhoe Bay and the Sagavanirktok River that have been indicated by anecdotal reports.

A project has been proposed that seeks to assess stocks of char in streams of the eastern portion of the North Slope. The objective of this project will be to conduct an aerial index of spawning

and over wintering congregations in the Ivishak (Sagavanirktok), Anaktuvuk, Kongakut, Canning Aichilik and Hulahula rivers with the goal of establishing an effective monitoring program for detecting changes in these populations.

A project to examine the status of lake-dwelling Arctic char inhabiting a few small lakes adjacent to the Dalton Highway is planned for 2000. Lake trout populations within the corridor are protected with a no harvest regulation while the regulation for lake dwelling char provides for a bag and possession limit of limit of two fish. Results from the 2000 project will indicate if an adjustment in regulation for lake dwelling char in the Dalton Highway corridor is needed.

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APPENDIX A

Appendix A1.-Sport harvest and catch from the Yukon subarea (SWHS Area Y), 1977-1998.

Year	All Fish Total	Salmon					Non-Salmon							
	Chinook	Coho	Sockeye	Pink	Chum	Lake Trout	Char	Grayling	Whitefish	Sheefish	Northern Pike	Burbot	Other Fish	
Harvest														
1977	4,168	56	31	0	6	16	308	88	180	899	180	899	43	0
1978	9,814	360	163	0	93	293	262	823	388	2583	388	2583	362	0
1979	10,993	39	25	0	16	109	173	531	271	1446	271	1446	18	0
1980	13,291	15	0	0	19	0	293	506	251	2498	251	2498	60	0
1981	10,173	6	0	0	11	17	302	197	509	2718	509	2718	219	0
1982	13,580	22	139	0	41	82	720	470	372	3551	372	3551	444	0
1983	13,225	0	52	0	0	349	305	856	259	3318	259	3318	10	10
1984	10,531	13	0	0	78	0	143	143	104	2960	104	2960	52	0
1985	7,985	12	12	0	0	12	485	382	245	2132	245	2132	210	0
1986	10,775	15	161	0	98	202	508	91	214	3470	214	3470	122	0
1987	12,740	0	61	0	0	226	0	541	128	2492	128	2492	32	0
1988	12,363	91	183	0	0	546	0	618	656	3526	656	3526	18	0
1989	14,720	100	215	0	0	997	272	726	757	3516	757	3516	367	34
1990	9,948	105	228	0	0	417	220	391	323	2474	323	2474	507	0
1991	14,258	143	430	180	0	449	434	675	1341	4454	1341	4454	160	0
1992	11,416	313	551	58	27	618	193	672	553	3590	553	3590	422	0
1993	8,128	122	619	0	0	193	101	528	436	2347	436	2347	279	0
1994	9,445	410	728	0	0	90	59	488	391	1968	391	1968	145	503
1995	7,311	37	162	0	0	189	66	122	476	1937	476	1937	216	603
1996	6,765	49	247	0	0	95	0	575	326	1690	326	1690	9	46
1997	7,790	35	132	0	0	167	0	251	446	2923	446	2923	239	256
1998	8,633	281	189	81	114	412	30	203	601	2446	601	2446	133	0
Averages														
1977-87	49	59	0	33	119	318	318	421	6,490	212	266	2,552	143	1
(%) ^a	(0.5)	(0.5)	(0.0)	(0.3)	(1.1)	(3.0)	(3.0)	(3.9)	(60.9)	(2.0)	(2.5)	(23.9)	(1.3)	(0.0)
1988-97	141	350	24	3	376	135	135	505	4,640	239	571	2,843	236	144
(%)	(1.4)	(3.4)	(0.2)	(0.0)	(3.7)	(1.3)	(1.3)	(4.9)	(45.5)	(2.3)	(5.6)	(27.8)	(2.3)	(1.4)
1993-97	131	378	0	0	147	45	45	393	3,638	109	415	2,173	178	282
(%)	(1.7)	(4.8)	(0.0)	(0.0)	(1.9)	(0.6)	(0.6)	(5.0)	(46.1)	(1.4)	(5.3)	(27.5)	(2.3)	(3.6)

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Appendix A1.-Page 2 of 2.

Year	All Fish Total	Salmon					Non-Salmon							
		Chinook	Coho	Sockeye	Pink	Chum	Lake Trout	Char	Grayling	Whitefish	Sheefish	Northern Pike	Burbot	Other Fish
Catch														
1990	62,327	199	533	0	0	2,149	914	2,842	34,299	914	2,251	17,717	509	0
1991	48,722	316	859	205	77	1,839	757	5,202	23,458	459	1,495	13,895	160	0
1992	43,322	1,242	1,329	107	155	1,960	741	3,744	17,300	349	1,569	14,801	25	0
1993	45,034	640	1,023	9	0	1,224	196	4,249	21,420	302	2,127	13,502	342	0
1994	36,015	510	1,109	9	0	351	177	1,779	15,951	301	1,121	11,694	152	2,861
1995	32,282	177	542	0	0	734	155	751	11,454	109	1,335	15,828	288	909
1996	38,726	182	297	0	0	332	0	1,345	19,891	0	1,463	14,389	18	809
1997	39,040	158	327	0	0	481	0	758	16,401	202	1,017	18,820	354	522
1998	49,848	554	465	1041	1,170	3,998	82	1,978	18,773	415	1,360	19,863	149	0
Averages														
1990-97	43,184	428	752	41	29	1134	368	2,584	20,022	330	1,547	2,552	231	638
(%) ^a		(1.0)	(1.7)	(0.1)	(0.1)	(2.6)	(0.9)	(6.0)	(46.4)	(0.8)	(3.6)	(23.9)	(0.5)	(1.5)
1993-97	28,319	333	660	4	0	624	106	1,776	17,023	183	1,413	2,843	231	1,020
(%)		(0.9)	(1.7)	(0.0)	(0.0)	(1.6)	(0.3)	(4.6)	(44.5)	(0.5)	(3.7)	(27.8)	(0.6)	(2.7)

^a Percentage of all fish from Yukon subarea.

Appendix A2.-Sport harvest and catch from the upper Kuskokwim subarea, 1983-1998.

Year	All Fish Total	Salmon					Non-Salmon									Other Fish
	Chinook	Coho	Sockeye	Pink	Chum	Lake Trout	Char	Rainbow Trout	Grayling	Whitefish	Sheefish	Northern Pike	Burbot			
Harvest																
1983	7142	231	483	41	-	514	315	775	52	3137	273	556	765	-		
1984	2235	104	585	-	-	26	-	52	78	974	-	195	169	-	52	
1985	1615	49	112	60	-	50	17	399	-	503	-	140	295	-	-	
1986	1294	-	293	98	-	-	-	293	-	391	147	48	-	24	-	
1987	3934	63	671	147	-	168	-	739	-	1413	42	308	348	35	-	
1988	3893	18	273	127	-	-	145	200	54	1330	382	127	1237	-	-	
1989	2529	100	100	-	112	-	13	504	-	606	30	270	794	-	-	
1990	725	-	36	12	-	216	36	18	-	301	-	53	53	-	-	
1991	3151	-	481	-	-	119	43	303	15	569	-	141	1480	-	-	
1992	1411	55	275	49	18	129	224	73	24	107	28	173	256	-	-	
1993	1578	85	55	112	-	225	*	79	-	218	-	45	142	-	589	
1994	1404	108	244	43	17	-	-	183	-	292	-	130	314	10	18	
1995	1378	169	179	-	-	-	25	78	-	357	-	189	381	-	-	
1996	1299	265	326	24	99	105	25	71	12	270	-	-	102	-	-	
1997	2086	195	860	37	22	-	-	232	-	250	-	251	239	-	-	
1998	3260	183	95	61	-	187	-	141	-	1933	107	87	466	-	-	
Averages																
1983-97	2378	96	332	49	18	103	57	267	16	715	60	175	438	5	44	
(%)		(4)	(14)	(2)	(1)	(4)	(2)	(11)	(1)	(30)	(3)	(7)	(18)	(0)	(2)	
1988-97	1945	100	283	40	27	79	52	174	11	430	44	138	500	1	61	
(%)		(5)	(15)	(2)	(1)	(4)	(3)	(9)	(1)	(22)	(2)	(7)	(26)	(0)	(3)	
1993-97	1549	164	333	43	28	66	12	129	2	277	-	123	236	2	121	
(%)		(11)	(21)	(3)	(2)	(4)	(1)	(8)	(0)	(18)	(0)	(8)	(15)	(0)	(8)	

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Year	All Fish	Salmon					Non-Salmon								
	Total	Chinook	Coho	Sockeye	Pink	Chum	Lake Trout	Char	Rainbow Trout	Grayling	Whitefish	Sheefish	Northern Pike	Burbot	Other Fish
Catch															
1990	4,734	27	207	24	-	448	53	387	-	2,761	-	193	634	-	-
1991	11,360	-	717	76	-	199	100	3,485	106	4,083	-	398	2,197	-	-
1992	6,575	288	558	189	92	578	355	647	309	1,775	46	508	1,230	-	-
1993	11,180	725	242	980	17	1,063	9	2,204	347	2,103	-	1,317	1,565	-	589
1994	6,772	207	480	60	83	247	184	662	108	2,564	19	208	1,877	10	18
1995	8,193	401	481	-	-	414	97	1,062	-	2,036	-	622	3,080	-	-
1996	9,294	883	1,318	337	198	343	62	535	71	3,868	-	206	1,473	-	-
1997	16,091	1,145	2,848	211	22	103	34	2,173	17	5,159	-	2,113	2,266	-	-
1998	19,343	1,167	339	224	-	366	-	648	17	11,912	337	1,500	2,816	17	-
Averages															
1990-97	9,275	460	856	235	52	424	112	1,394	120	3,044	8	696	1,790	1	76
(%)		(5)	(9)	(3)	(1)	(5)	(1)	(15)	(1)	(33)	(0)	(8)	(19)	(0)	(1)
1993-97	10,306	672	1,074	318	64	434	77	1,327	109	3,146	4	893	2,052	2	121
(%)		(7)	(10)	(3)	(1)	(4)	(1)	(13)	(1)	(31)	(0)	(9)	(20)	(0)	(1)

Appendix A3.-Sport harvest and catch from the Kuskokwim Bay (SWHS Area V), 1977-1998.

Year	All Fish Total	Salmon					Non-Salmon								Other Fish
	Chinook	Coho	Sockeye	Pink	Chum	Lake Trout	Char	Rainbow Trout	Grayling	Whitefish	Sheefish	Northern Pike	Burbot		
Harvest															
1977	7,232	130	412	69	95	225	124	1,615	220	2461	166	253	962	183	317
1978	8,783	269	403	85	836	741	172	1,121	362	2912	261	163	554	-	904
1979	10,881	361	512	110	-	373	218	1,451	318	5256	327	283	1,581	73	18
1980	14,889	863	2,014	112	93	603	267	973	664	5489	275	351	2,556	586	43
1981	12,720	1,014	583	117	6	1,107	117	1,579	982	4362	349	374	1,698	432	
1982	28,007	1,099	52	420	347	2,035	464	3,124	755	6149	826	560	3,220	1,358	7,598
1983	31,793	1,962	1,910	261	420	1,195	419	4,562	1,678	7365	3178	828	3,231	462	4,322
1984	14,287	1,221	3,623	299	273	896	662	1,883	1,442	2195	26	468	1,247	-	52
1985	10,693	1,080	1,156	149	-	423	34	2,168	659	1787	175	175	1,040	35	
1986	10,751	987	3,232	420	72	973	1,110	1,849	504	1117	147	72	122	146	
1987	12,872	981	4,819	419	18	656	28	2,090	592	2019	91	398	606	119	
1988	21,201	2,456	4,492	746	892	836	191	3,764	1,599	2440	473	637	2,346	91	
1989	21,122	2,147	4,282	291	191	2,213	1,086	3,545	757	2622	571	296	1,785	12	
1990	95,612	897	1,358	620	347	749	72	1,797	475	1340	88	107	231	1,125	
1991	13,108	786	2,087	514	36	647	272	2,924	774	2603	158	154	2,018	40	95
1992	9,200	1,046	2,033	189	219	927	356	802	404	545	286	292	752	169	11
1993	13,647	1,674	2,056	715	27	731	218	1,499	486	739	253	54	995	214	589
1994	14,065	2,148	2,978	894	126	1,626	40	1,398	229	850	183	390	828	20	18
1995	9,197	1,328	2,771	277	16	455	215	1,260	429	845	-	272	655	-	20
1996	13,902	2,439	5,231	752	167	517	426	1,743	567	663	20	20	344	-	
1997	16,858	3,039	5,565	587	77	289	441	3,000	1,192	1232	317	495	515	-	30
1998	25,317	3,908	4,897	1,862	133	644	141	1,571	531	3554	1220	277	2,711	185	
Averages															
1977-86	15,004	899	1,390	204	214	857	359	2,033	758	3909	573	353	1621	328	1,325
(%)		(6.0)	(9.3)	(1.4)	(1.4)	(5.7)	(2.4)	(13.5)	(5.1)	(26.1)	(3.8)	(2.4)	(10.8)	(2.2)	(8.8)
1987-97	14,067	1,722	3,425	546	192	877	276	2,166	682	1445	222	283	1007	163	69
(%)		(12.2)	(24.3)	(3.9)	(1.4)	(6.2)	(2.0)	(15.4)	(4.8)	(10.3)	(1.6)	(2.0)	(7.2)	(1.2)	(0.5)
1993-97	13,534	2,126	3,720	645	83	724	208	1,780	581	866	155	246	667	47	131
(%)		(15.7)	(27.5)	(4.8)	(0.6)	(5.3)	(1.5)	(13.2)	(4.3)	(6.4)	(1.1)	(1.8)	(4.9)	(0.3)	(1.0)

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Appendix A3.-Page 2 of 2.

Year	All Fish Total	Salmon					Non-Salmon								Other Fish
	Chinook	Coho	Sockeye	Pink	Chum	Lake Trout	Char	Rainbow Trout	Grayling	Whitefish	Sheefish	Northern Pike	Burbot		
Catch															
1990	78,131	3,230	6,184	3,644	7,332	5,853	1,091	18,789	12,436	13,790	493	316	3,449	1,125	
1991	70,256	2,621	6,538	3,528	741	3,491	1,019	30,155	11,546	14,983	329	539	4,621	50	95
1992	65,036	4,752	2,785	1,791	9,262	7,525	1,426	16,229	5,540	9,539	322	638	3,878	169	11
1993	110,259	9,684	8,390	3,637	1,132	10,741	1,314	35,825	12,646	16,596	395	1,952	3,721	214	598
1994	77,517	3,370	5,564	4,898	4,516	11,848	1,861	18,320	8,258	10,930	500	628	4,383	20	84
1995	73,467	7,271	8,990	1,364	310	9,693	540	17,503	10,532	9,598	63	1,416	5,430	-	71
1996	126,960	14,283	18,162	4,599	3,217	17,118	987	28,504	16,075	18,284	137	295	3,822	-	109
1997	215,857	20,910	25,607	4,685	1,118	11,045	1,269	61,412	35,405	46,046	640	2,990	4,088	147	164
1998	237,351	22,966	43,611	9,269	15,090	22,065	997	65,257	33,775	3,990	2,087	3,905	9,672	457	275
Averages															
1990-97	103,435	8,265	10,278	3,518	3,454	9,664	1,188	28,342	14,055	17,471	360	1,097	4,174	216	142
(%)		(8.0)	(9.9)	(3.4)	(3.3)	(9.3)	(1.1)	(27.4)	(13.6)	(16.9)	(0.3)	(1.1)	(4.0)	(0.2)	(0.1)
1993-97	120,812	11,104	13,343	3,837	2,059	12,089	1,194	32,313	16,583	20,291	347	1,456	4,289	76	203
(%)		(9.2)	(11.0)	(3.2)	(1.7)	(10.0)	(1.0)	(26.7)	(13.7)	(16.8)	(0.3)	(1.2)	(3.5)	(0.1)	(0.2)

Appendix A4.-Sport harvest and catch from the North Slope subarea (SWHS Area Z), 1977-1998.

Year	All Fish Total	Salmon		Non-Salmon						
		Pink	Chum	Lake Trout	Char	Grayling	Whitefish	Northern Pike	Burbot	Other Fish
Harvest										
1977	1,568	0	0	88	241	1,239	0	0	0	0
1978	868	0	0	9	181	678	0	0	0	0
1979	2,010	0	0	264	364	1,382	0	0	0	0
1980	2,971	0	0	379	827	1,765	0	0	0	0
1981	4,546	0	0	454	1,188	2,904	0	0	0	0
1982	6,771	0	0	629	2,065	4,077	0	0	0	0
1983	6,708	283	0	367	1,966	2,884	125	0	83	0
1984	5,896	0	0	481	1,507	2,441	13	0	0	1,454
1985	10,615	0	0	1,707	3,489	5,382	0	37	0	0
1986	9,386	0	0	415	983	4,099	3,776	19	94	0
1987	4,957	0	0	274	2,676	1,932	75	0	0	0
1988	2,147	55	0	73	1,018	983	18	0	0	0
1989	3,883	0	0	482	1,031	2,113	109	0	148	0
1990	1,482	0	0	168	489	791	17	0	17	0
1991	4,676	0	15	176	1,199	3,301	0	0	0	0
1992	2,436	18	17	379	836	1,145	18	0	25	0
1993	2,926	0	0	106	1,092	1,632	0	58	21	0
1994	1,880	0	0	73	589	807	58	0	353	0
1995	2,004	0	0	38	896	983	18	0	69	0
1996	1,689	0	9	18	887	753	0	0	0	22
1997	1,852	0	0	40	741	1,071	0	0	0	0
1998	2,938	13	0	243	1,450	1,207	0	0	25	0
Averages										
1977-87 (%)	5,118	28 (0.6)	0 (0.0)	479 (9.4)	1,381 (27.0)	2,685 (52.5)	391 (7.6)	6 (0.1)	18 (0.3)	145 (2.8)
1988-97 (%)	2,498	7 (0.3)	4 (0.1)	166 (6.7)	1,041 (41.7)	1,410 (56.5)	28 (1.1)	5 (0.2)	58 (2.3)	2 (0.1)
1993-97 (%)	2,070	0 (0.0)	5 (0.3)	55 (2.7)	841 (40.6)	1,049 (50.7)	15 (0.7)	12 (0.6)	89 (4.3)	4 (0.2)

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Year	All Fish Total	Salmon		Non-Salmon						
		Pink	Chum	Lake Trout	Char	Grayling	Whitefish	Northern Pike	Burbot	Other Fish
Catch										
1990	11,935	0	0	1,728	3,744	5,482	302	17	17	285
1991	12,852	0	0	932	2,670	9,200	50	0	0	0
1992	11,656	82	76	887	3,850	6,608	120	0	33	0
1993	13,932	10	17	266	3,946	9,345	192	135	21	0
1994	12,857	16	10	327	3,178	8,552	107	54	613	0
1995	9,113	0	0	370	3,229	5,427	18	0	69	0
1996	12,010	0	92	781	4,811	6,286	0	0	18	22
1997	16,440	11	0	110	2,881	13,163	254	0	21	0
1998	16,854	13	0	1,367	7,677	7,713	16	0	42	26
Averages										
1990-97 (%)	12,599	15 (0.1)	24 (0.2)	675 (5.4)	3,539 (28.1)	8,053 (63.9)	130 (1.0)	26 (0.2)	99 (0.8)	38 (0.3)
1993-97 (%)	12,870	7 (0.1)	24 (0.2)	371 (2.9)	3,609 (28.0)	8,555 (66.5)	114 (0.9)	38 (0.3)	148 (1.2)	4 (0.0)

APPENDIX B

Appendix B1.-Commercial and subsistence of chinook salmon in the Yukon and Kuskokwim areas, 1977-1998.

Year	Area					
	Tanana River		Yukon River		Kuskokwim River	
	Commercial	Subsistence	Commercial	Subsistence	Commercial	Subsistence
1977	1,008	1,463	95,749	16,118	58,256	58,158
1978	635	1,231	98,533	29,066	63,194	38,145
1979	772	1,333	126,901	29,672	53,314	57,053
1980	1,947	1,826	152,038	40,898	48,599	62,047
1981	987	2,085	157,031	27,605	79,377	64,274
1982	981	2,443	122,663	25,715	79,816	61,141
1983	911	2,706	146,999	46,772	93,676	51,020
1984	867	3,599	119,037	38,829	74,016	60,668
1985	1,142	7,375	145,046	32,396	74,083	45,720
1986	950	3,701	99,020	41,537	44,972	54,256
1987	3,338	4,096	131,422	50,943	65,558	71,804
1988	762	4,884	99,602	40,611	74,563	57,107
1989	1,741	2,546	102,457	45,916	66,914	85,322
1990	2,156	2,618	93,504	45,969	84,451	92,678
1991	1,072	2,515	105,344	44,258	48,170	90,224
1992	753	2,438	120,419	44,639	67,597	68,665
1993	1,445	1,672	92,665	62,243	26,636	91,721
1994	2,606	2,370	111,234	51,532	27,345	98,378
1995	2,747	1,779	121,305	48,841	72,352	100,159
1996	447	1,177	89,745	44,494	22,959	81,598
1997	2,728	2,712	110,882	54,405	47,990	85,506
1998	963	1,919	42,736	52,205	44,402	86,115
Averages						
1977-97	1,428	2,694	116,266	41,069	60,659	70,269
1988-97	1,646	2,471	104,716	48,291	53,898	85,136
1993-93	1,995	1,942	105,166	52,303	39,456	91,472

Yukon River in Alaska, exclusive of Tanana River

Kuskokwim River and Kuskokwim Bay (Burkey et al.)

Subsistence harvest data from Borba and Hamner 1995-99

Yukon commercial harvest data from Bergstrom et al. 1999

Appendix B2.-Commercial and subsistence harvest of summer and fall chum salmon in the Yukon and Kuskokwim areas, 1977-1998.

Year	Area					
	Tanana River		Yukon River		Kuskokwim River	
	Commercial	Subsistence	Commercial	Subsistence	Commercial	Subsistence
1977	22,990	45,187	76,871	197,086	298,959	-
1978	59,996	42,327	1,265,002	249,684	282,044	-
1979	63,737	57,969	1,134,208	371,565	297,167	-
1980	58,657	60,036	1,307,508	385,019	561,483	-
1981	63,472	37,579	1,693,965	359,230	485,635	-
1982	30,530	28,023	911,475	365,843	326,481	-
1983	61,517	55,888	1,241,614	377,426	306,554	-
1984	77,204	46,167	1,019,396	359,403	488,482	-
1985	110,805	61,581	1,093,477	409,719	224,680	95,999
1986	54,703	42,197	1,274,166	412,671	349,268	-
1987	11,060	60,920	611,481	466,112	603,274	70,709
1988	65,425	46,735	1,719,054	340,178	1,443,953	153,980
1989	103,429	66,522	1,670,844	314,277	801,355	145,106
1990	65,808	48,853	603,034	234,656	521,023	131,469
1991	68,340	45,538	851,850	218,526	502,187	96,308
1992	26,250	35,217	539,723	214,783	436,506	99,576
1993	3,705	16,651	136,411	185,805	94,937	61,726
1994	35,803	44,141	230,937	204,231	360,893	76,951
1995	111,545	60,829	991,047	206,114	707,212	68,942
1996	64,464	43,953	707,204	210,043	301,975	90,238
1997	25,287	23,374	261,152	184,587	67,200	40,976
1998	570	20,374	28,228	129,893	268,199	67,665
Averages						
1977-97	56,416	46,176	953,972	298,427	450,537	94,332
1988-97	57,006	43,181	771,126	231,320	523,724	96,527
1993-93	48,161	37,790	465,350	198,156	306,443	67,767

Yukon River in Alaska, exclusive of Tanana River

Kuskokwim River and Kuskokwim Bay (Burkey et al.)

Subsistence harvest data from Borba and Hamner 1995-99

Yukon commercial harvest data from Bergstrom et al. 1999

Appendix B3.-Commercial and subsistence harvest of coho salmon in the Yukon and Kuskokwim areas, 1977-1998.

Year	Area					
	Tanana River		Yukon River		Kuskokwim River	
	Commercial	Subsistence	Commercial	Subsistence	Commercial	Subsistence
1977	1,284	6,348	37,579	9,985	263,727	0
1978	3,066	4,709	23,086	3,078	247,271	0
1979	2,791	4,612	14,374	5,182	308,683	0
1980	1,226	5,163	7,519	14,995	327,908	0
1981	2,284	9,261	21,396	11,967	278,541	0
1982	7,780	7,418	29,396	28,476	567,452	0
1983	6,168	6,922	7,152	16,983	248,389	0
1984	7,688	14,785	74,252	34,235	826,774	0
1985	11,762	11,761	45,910	20,503	382,096	0
1986	441	13,321	46,814	21,147	736,910	0
1987	0	21,730	0	24,483	478,594	0
1988	13,972	30,201	85,935	39,478	623,733	43,866
1989	16,084	18,841	69,409	22,083	554,411	57,847
1990	14,804	17,613	32,133	25,847	443,783	50,713
1991	9,774	21,561	99,883	15,827	556,818	55,581
1992	7,979	17,554	1,629	34,426	772,449	44,496
1993	0	4,304	0	11,508	686,570	35,295
1994	4,452	26,489	-1	15,286	856,100	36,504
1995	6,900	18,802	40,113	9,575	555,539	39,165
1996	7,142	14,893	48,840	15,511	1,099,865	34,698
1997	0	11,595	35,320	12,350	166,648	30,714
1998	0	7,472	1	10,649	312,517	27,240
Averages						
1977-97	5,981	13,709	34,321	18,711	522,965	42,888
1988-97	8,111	18,185	41,326	20,189	631,592	42,888
1993-93	3,699	15,217	24,854	12,846	672,944	35,275

Yukon River in Alaska, exclusive of Tanana River.

Kuskokwim River and Kuskokwim Bay.

**Appendix B4.-The Yukon River drainage fall chum salmon management plan, 2000
(from Bergstrom et al. 1999).**

Run Size Estimate <i>b</i> (Point Est	Recommended Management Action <i>a</i> Fall Chum Salmon Directed Fisheries				Targeted Drainagewide Escapement
	Commercial	Personal Use	Sport	Subsistence	
350000 or Less	Closure	Closure	Closure	Closure <i>c</i>	350000
350001 to 450000	Closure	Closure	Closure	Restrictions <i>d</i>	350000
450001 to 550000	Closure	Closure	Closure	Restrictions <i>d</i>	375000
550001 to 600000	Closure	Closure <i>e</i>	Closure <i>e</i>	Restrictions <i>d</i>	400000
600001 to 675000	Closure	Normal Fishing Schedules	Retention Allowed	Normal Fishing Schedules	400000 or More
Greater Than 675000	Commercial Fishing Considered <i>f</i>	Normal Fishing Schedules	Retention Allowed	Normal Fishing Schedules	400000 or More

1999
Run Reconstruction
598800
Fall Chum Salmon

2000
Preseason Projection
569000
to 1,137,000
Fall Chum Salmon

Appendix B4.- Page 2 of 2.

- a* Considerations for the Toklat River and Canadian Mainstem rebuilding plans may require more restrictive management actions.
- b* The department will use the best available data including preseason projections, mainstem river sonar passage estimates, test fisheries indices, subsistence and commercial fishing reports, and passage estimates from escapement monitoring projects to assess the run size.
- c* The department may, by emergency order, allow subsistence chum salmon directed fisheries in areas that indicator(s) suggest that the escapement goal(s) in that area will be achieved.
- d* The department may, by emergency order, allow a less restrictive or a normal subsistence fishing schedule in areas that indicator(s) suggest that the escapement goal(s) in that area will be achieved.
- e* The department may, by emergency order, allow personal use and sport fishing in areas that have normal subsistence fishing schedules and indicator(s) that suggest the escapement goal(s) in that area will be achieved.
- f* When the projected run size is more than 675,000 chum salmon, the department may allow for a drainage-wide commercial fishery with the targeted harvest of the surplus above 625,000 chum salmon distributed by district or subdistrict proportional to the guideline established in harvest range 5 AAC 05.365. The department shall distribute the harvest at levels below the low end of the guideline harvest range by district or subdistrict proportional to the mid-point of the guideline harvest range.

5 AAC 05.365. (4) manage the commercial fishery during the fall chum salmon season for a guideline harvest range of 72,750 to 320,500 chum salmon, distributed as follows:

- (A) Districts 1, 2 and 3: 60,000 to 220,000 chum salmon;
- (B) Subdistricts 4-B and 4-C: 5,000 to 40,000 chum salmon;
- (C) Subdistricts 5-A, 5-B, and 5-C: 4,000 to 36,000 chum salmon;
- (D) Subdistrict 5-D: 1,000 to 4,000 chum salmon;
- (E) District 6: 2,750 to 20,500 chum salmon.

Appendix B5.-Guideline harvest ranges and mid-points for commercial harvest of chinook, summer chum and fall chum salmon, Yukon area, Alaska, 1999.

Chinook Salmon						
District or Subdistrict	Guideline Harvest Range					
	Lower		Mid-Point		Upper	
	Numbers	Percent	Numbers	Percent	Numbers	Percent
1 and 2	60,000	89.1	90,000	91.5	120,000	92.9
3	1,800	2.7	2,000	2.0	2,200	1.7
4	2,250	3.3	2,550	2.6	2,850	2.2
5A, B, C	2,400	3.6	2,600	2.6	2,800	2.2
5D	300	0.4	400	0.4	500	0.4
6	600	0.9	700	0.7	800	0.6
Total	67,350	100	98,250	100.0	129,150	100.0

Summer Chum Salmon						
District or Subdistrict	Guideline Harvest Range					
	Lower		Mid-Point		Upper	
	Numbers	Percent	Numbers	Percent	Numbers	Percent
1 and 2	251,000	62.8	503,000	62.9	755,000	62.9
3	6,000	1.5	12,500	1.6	19,000	1.6
4A ^a	113,000	28.3	225,500	28.2	338,000	28.2
4B, C	16,000	4.0	31,500	3.9	47,000	3.9
5	1,000	0.3	2,000	0.3	3,000	0.3
6	13,000	3.3	25,500	3.2	38,000	3.2
Total	400,000	100.00	8,000,000	100.0	1,200,000	100.0

Anvik River Management Area roe cap f 100,000 pounds.

Fall Chum Salmon						
District or Subdistrict	Guideline Harvest Range					
	Lower		Mid-Point		Upper	
	Numbers	Percent	Numbers	Percent	Numbers	Percent
1, 2 and 3	60,000	82.5	140,000	71.2	220,000	68.6
4B, C	5,000	6.9	22,500	11.4	40,000	12.5
5A, B, C	4,000	5.5	20,000	10.2	36,000	11.2
5D	1,000	1.4	2,500	1.3	4,000	1.2
6	2,750	3.8	11,625	5.9	20,500	6.4
Total	72,750	100.0	196,625	100.0	320,500	100.0

^a Or the equivalent roe poundage of 61,000 to 183,000 pounds or some combination of fish and pounds of roe. Anvik River Management Area has an additional roe cap of 100,000 pounds which is not included in Subdistrict 4-A's guideline harvest range.

Appendix B6.-Yukon River Coho Salmon Management Plan.

5 AAC 05.369. YUKON RIVER COHO SALMON MANAGEMENT PLAN.

(a) The goal of this plan is to provide for the management of directed commercial coho salmon fishing in the Yukon River. The majority of Yukon River coho salmon spawn in tributaries that flow into the Yukon River from the mouth of the Yukon river up to and including the Tanana River drainage. The management of directed coho salmon fishing during the fall season is complicated by an overlapping run of more abundant fall chum salmon stocks.

(b) For the purpose of (c) of this section, the department shall use the best available information to assess coho salmon abundance including mainstem river sonar passage estimates, test fisheries indices, subsistence and commercial fishing reports, and estimates from escapement monitoring projects.

(c) The department may allow a directed coho salmon fishery under this section in years when

(1) the return of coho salmon measured under (b) of this section is above the average of previous years;

(2) the fall chum salmon return is assessed by the department to be more than 625,000 fish; and,

(3) no directed fall chum salmon commercial fishing has occurred or the department determines that it is not expected to occur.

(d) Fall chum salmon harvested during a directed commercial coho salmon fishery under this section will be considered incidental any may only occur on the harvestable surplus of fall chum salmon above 625,000 fish.

(e) In a year when a directed commercial coho salmon fishery is opened under this section in

(1) Districts 1, 2, and 3, the commissioner shall close, by emergency order, the coho salmon fall season no later than September 5;

(2) Subdistricts 4-B, 4-C, and 5-A, and District 6, the commissioner shall close, by emergency order, the coho salmon fall season no later than October 5;

(3) Subdistrict 4-A, the commissioner may open, by emergency order, the directed commercial coho salmon fishery on or after August 20, and shall close the fishery no later than September 15.

(f) In Subdistrict 5-B, 5-C, and 5-D there will be no directed commercial coho salmon fishery unless the department determines that there will be a harvestable surplus of coho salmon.

(g) The department shall distribute, to the extent practicable, the harvest opportunity in the directed coho salmon fishery between districts and subdistricts as follows:

-continued-

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- (1) 24 hours of combined fishing time in Districts 1, 2, and 3 will be considered equal to 32 hours of fishing time in:
 - (A) Subdistrict 4-A;
 - (B) Subdistricts 4-B and 4-C combined;
 - (C) Subdistrict 5-A; and,
 - (D) District 6;
 - (2) to ensure an orderly and conservative fishery, coho salmon fishing will be managed as follows:
 - (A) in Districts 1, 2, and 3 combined, fishing time shall not exceed 24 hours in a seven-day period;
 - (B) in District 4-A, fishing time shall not exceed 32 hours in a seven-day period;
 - (C) in Subdistricts 4-B and 4-C combined, fishing time shall not exceed 32 hours in a seven-day period;
 - (D) in Subdistrict 5-A, fishing time shall not exceed 32 hours in a seven-day period;
 - (E) in District 6, fishing time shall not exceed 32 hours in a seven-day period;
- (h) The provisions of this section do not apply after January 1, 2001.

APPENDIX C

Appendix C1.-Estimated passage through the Kogruluk River weir, Holitna River drainage.

Species	Passage	Year				
	Goal	1995	1996	1997	1998	1999
Chinook	10,000	20,630	14,199	13,285	11,869	5,570
Chum	30,000	31,265	48,494	7,937 ^a	36,424	13,820 ^b
Coho	25,000	27,856	50,555	12,312	24,344	12,609 ^c

^a Commercial and sport fisheries closed by Emergency Order.

^b Commercial and sport fisheries closed by Emergency Order.

^c Commercial fishery closed, sport fishery bag limit reduction by Emergency Order.

Appendix C2.-Changes in sport fishing regulations for the upper Kuskokwim River, Alaska BOF 1997.

Aniak River				
Species	1977		1998	
	Daily Bag and Possession Limits		Daily Bag and Possession Limits	
King salmon	3	(only 2 over 28 inches)	3	(only 2 over 28 inches)
Other salmon	5	no size limit	5	no size limit
AD/DV	10	(only 2 over 20 inches)	5	(only 1 over 20 inches)
Lake Trout	4	no size limit	4	no size limit
Rainbow trout	0	catch & release	0	Catch & release
Arctic grayling	10	no size limit	5	no size limit
Sheefish	10	No size limit	5	No size limit
Northern pike	10	No size limit	5	(only 1 over 30 inches)

Holitna River				
Species	1977		1998	
	Daily Bag and Possession Limits		Daily Bag and Possession Limits	
King salmon	3	(only 2 over 28 inches)	3	(only 2 over 28 inches)
Other salmon	5	no size limit	5	no size limit
AD/DV	10	(only 2 over 20 inches)	3	no size limit
Lake Trout	4	no size limit	4	no size limit
Rainbow trout	2	catch & release	2	(only 1 over 20 inches)
Arctic grayling	10	no size limit	2	no size limit
Sheefish	10	No size limit	2	no size limit
Northern pike	10	No size limit	5	(only 1 over 30 inches)

Additional site specific regulations for rainbow trout were adopted for the Kisaralik, Kasigluk and Kwethluk rivers.

APPENDIX D

Appendix D.-Aerial estimates of Arctic char from the Ivishak, Anaktuvuk, and Kongahut rivers of the North Slope.

Year	Date	Ivishak River	Anaktuvuk River	Kongahut River	Survey Method	Survey Rating	Data Source
1971	22-Sept	24,470	-	-	H	Good	Yoshihara 1973
1972	24-Sept	11,937	-	-	H	Good	Yoshihara 1972
1973	11-Sept	8,992	-	-	H	Excellent	Furniss 1975
1974	10-Sept	11,000	-	-	H	Not Rated	Furniss 1975
1975	22-Sept	8,306	-	-	H	Not Rated	Bendock ADF&G files
1976	22-Sept	8,570	-	-	H	Fair	Bendock ADF&G files
1977	NS	-	-	-	-	-	-
1978	NS	-	-	-	-	-	-
1979	22-Sept	24,403	15,717	-	S	Excellent	Bendock 1980
1980	NS	-	-	-	-	-	-
1981	22-Sept	24,873	10,536	-	S	Excellent	Bendock 1982
1982	22-Sept	36,432	6,222	-	S	Excellent	Bendock 1983
1983	22-Sept	27,820	8,743	-	S	Excellent	Bendock and Burr 1984
1984	22-Sept	24,818	5,462	-	S	Excellent	Bendock and Burr 1985
1985	NS	-	-	-	-	-	-
1986	NS	-	-	8,900	?	?	Millard USFWS files
1987	NS	-	-	-	-	-	-
1988	NS	-	-	-	-	-	-
1989	22-Sept	12,650	-	6,355	H	Good	DeCicco ADF&G files
1990	NS	-	-	-	-	-	-
1991	NS	-	-	-	-	-	-
1992	NS	-	-	-	-	-	-
1993	3-Sept	3,057	-	-	H	Good	Millard USFWS files
1994	NS	-	-	-	-	-	-
1995	27-Sept	27,036	-	14,080	H	Good	Burr ADF&G files

NS = no survey

H = helicopter, S = fixed wing aircraft (Supercub)